THE IRON TRADE REVIEW

VOLUME XXXVI CLEVELAND, OHIO, DECEMBER 3, 1903 NUMBER 49

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The tone of reports from selling centers is rather more cheerful this week, but the movement of material is not such as to be significant. December is not an active month, and the wage reductions currently announced and the more general ones to come at the end of the year are not calculated to create optimism. Yet there is a general refusal throughout the trade to assume that deep or long-drawn depression is ahead. Mills and furnaces shut down, but other mills and furnaces start up, and the volume of shipments indicates average consumption, that only seems small by contrast with a business that could not be handled. Southern pig iron producers, whose operations have been the gauge of the market for so long a time, are evidently making a stand, though not concertedly, at $9.25 Birmingham for No. 2 foundry iron. Buyers who have offered to place business at $9 have been unable to do so, and but for the increasing number of sales on analysis, preventing accurate following of grade prices, it might be said that $9.25 for No. 2 iron is minimum. A report of the week, whose importance will be determined by events, is that a syndicate, composed chiefly of directors of a large Southern furnace company, has bought and taken off the market 75,000 tons, comprising nearly all the company's accumulated stock. Consumers have made further considerable purchases of Southern iron, Western buying being in some cases for round lots, and pipe works are negotiating for additional tonnage. Northern furnaces continue to let Southern sellers take business and will not meet their prices, though in the Pittsburg district and at certain points in Ohio Northern prices come closer to the Southern basis than was the case a few weeks ago. The readjustment of costs is the problem with Northern furnaces. Some wage reductions have been made, and on Jan. 1 Western Pennsylvania and Eastern Ohio furnaces will make general reductions. There remains much high-priced ore to use up, however, and Central Western furnaces, under their drastic curtailment program, will not need next year's ore before August. Coke has already had a considerable fall, but efforts to secure agreement among producers give no great promise of success. The H. C. Frick Coke Co. is reported to have one-third its output for sale, and has returned to its old policy of taking blast furnace as well as foundry contracts. With 3,000,000 tons a year of Frick coke available for the general market the prospect for firm prices is not good. Reductions in coke workers' wages are expected with the opening of the new year. Lower prices have been named for Bessemer iron but demand is very light. The Bessemer furnaces are now making only about 40 percent of their September output. The most important developments in finished lines are the action of independent sheet manufacturers at Pittsburg and the announcement that the Republic Iron & Steel Co. will turn a considerable portion of its Bessemer steel output at Youngstown into rails. In addition to their recent call for the removal of the limitation on output, which the Amalgamated Association is expected to grant, the independent sheet manufacturers ask for a 20 percent reduction in wages in view of a like reduction made in the non-union mills of the American Sheet Steel Co. The acceptance of such a reduction by the union in the middle of the scale year is problematic. If it is refused a number of independent sheet mills will shut down. Bar iron has declined further, and 1.25c at mill has been done in the Central West. Some strain is put upon the price agreement on structural shapes by bids recently made on some Central Western construction, these being for the delivery of the material partly fitted. Concession of 2½ to 5 percent continue to be made on wrought pipe and tubes by independent manufacturers. The whole finished material market is a week-to-week affair and little change is expected until the trade has fairly entered upon the new year. Some low prices have been made on scrap, particularly on heavy melting steel, in the Central West. Foundrymen in different sections are preparing to submit bids, to be opened Dec. 15, on from 200,000 to 300,000 tons of castings for the Pennsylvania Railroad tunnels at New York. Deliveries will extend over five years and it is expected that a number of foundries will have parts of the contract. Blast furnaces are being asked for prices on the iron.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, Dec. 2.

A slight improvement is noticeable in the local pig iron market, the number of orders increasing, although the tonnage is small. Most Southern producers are now holding No. 2 at $9.25 at a minimum and a number will not quote under $9.50 Birmingham, for local delivery. Northern furnaces continue to hold No. 2 at $14 to $14.50 and are making no effort whatever to meet the low quotations of the Southern furnaces. The market in finished lines has also improved to some extent, but buyers continue to buy for immediate requirements only. Steel producers are not shading the recent established prices on billets, the small amount of business offering no inducements for making concessions.

No plan has yet been formulated by the committee of the coke producers to prevent further reductions in foundry and furnace coke, and several of the largest producers in the Connellsville region have decided that they will not abide by any plan that is adopted and have withdrawn from the arrangement entirely. Members of the committee state that they are still working on a plan, but it is doubtful if it will ever be successfully carried out. At a meeting of the committee held recently, at which the pool feature was discussed it was announced that the H. C. Frick Coke Co. would offer in the open market hereafter about one-third of its output, or about 3,000,000 tons annually and that the furnace as well as the foundry trade would be sought. Contracts to furnish a number of furnaces with coke have already been closed by the Frick company. Quotations continue at $2.25 to $2.40 for first-class foundry coke and from $1.60 to $1.75 for furnace coke.

A meeting of the Independent Sheet Manufacturers' Association was held here yesterday at which it was decided to ask the Amalgamated Association to make a reduction in the wage scale amounting to about 20 percent, equal to the recent reductions made at the non-union mills of the American Sheet Steel Co. A special convention of the sheet workmen of the Amalgamated Association will be held here on Tuesday, Dec. 8, at which the present limit of output at all union sheet mills will be removed. Coke producers have practically decided to make reductions in wages in the coke regions the first of the year, while the furnace operators in the Mahoning and Shenango Valleys,

the Wheeling and Pittsburg districts are already contemplating a reduction in wages at the same time. The wages of the blast furnace workers in the Mahoning and Shenango Valleys were last advanced in June, 1902, and are based on iron about $7 per ton higher than the market at the present time. While the furnace operators in the two valleys have not yet taken any official action, a meeting will shortly be called for the purpose of deciding upon the amount of reduction.

It is reliably reported that the Republic Iron & Steel Co. will erect a rail mill at Youngstown, O., where its steel plant was recently enlarged, increasing the daily output to 1,500 tons. For some time this matter has been under consideration and the passing of the preferred dividend will provide funds for this purpose. This will greatly strengthen the position of the company and will provide an additional outlet for its steel production.

Pig Iron.—The pig iron market in this district has improved to some extent during the week, and while the aggregate tonnage is small, the number of orders is increasing. Southern producers are not quoting in this market below $9.25 Birmingham for No. 2, and only a few furnaces will do $7.75 on forge, the others naming $8. Northern furnaces are holding No. 2 at $14 to $14.50. Bessemer iron is now being offered at $14.50 to $14.75 Pittsburg, and basic at from 50 to 75 cents a ton below this. Northern forge is quoted at $12.75 to $13. With lower coke and a reduction in the wages of blast furnace workers, consumers of Northern iron are expecting lower quotations after the first of the year. While it is true that costs will be somewhat reduced, furnaces will continue to work on high priced ore, contracts not expiring until May 1, 1904, and as nearly all of the stacks have been banked or shut down entirely, from one to two months, there are accumulations of ore at all the furnaces that will not enable them to commence to consume ore from 1904 shipments before next August. Furnacemen insist that the last ore schedule must be materially reduced and it is certain that some concessions will be made. However, as ore is the largest factor in the production of pig iron it can be seen that the sweeping reductions in pig iron cost expected the first of the year cannot be made. The present quotations on limestone must also be reduced, but this cannot be done without lower wages at the limestone quarries, which will come shortly after the first of the year. This week the Carnegie Steel Co. resumed operations at two of its furnaces at Youngstown, O., while one stack of the Shenango Furnace Co. at Sharpsville, Pa., was blown out. The pig iron curtailment in the Central West is now close to 60 percent. We revise quotations as follows:

Bessemer, Valley	$13 65 to 13 90
Bessemer, Pittsburg	14 50 to 14 75
No. 1 Foundry	14 75 to 15 00
No. 2 Foundry	14 00 to 14 50
Gray Forge, Pittsburg	12 75 to 13 00
Chilled Basic, Valley	13 25 to 13 50
Chilled Basic, Pittsburg	14 10 to 14 35

Steel.—Very little new business is being offered and quotations are being firmly maintained. While there are reports that concessions are being made, consumers continue to place small tonnages at association prices. We make the following quotations: Bessemer and open-hearth billets, 4 x 4 inches, and slabs, up to and including 0.25 carbon, $23, Pittsburg, Wheeling, Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O.; 0.26 and including 0.60 carbon $1 advance and 0.61 to 1.00 carbon, $2 advance. Billets smaller than 3⅞ inches and sheet and tin bars are $1 per ton extra. Bessemer and open-hearth rods are quoted at $31 Pittsburg, but there is little buying, and no doubt a large order could be placed at $30.50.

Ferro-Manganese.—We quote foreign and domestic manganese, 80 percent, at $47 per ton delivered at buyer's mill, east of the Mississippi river.

Spelter.—The market continues to decline and prime Western grades are held at 4.80c to 4.85c Pittsburg.

Skelp.—There is a little better demand for skelp and producers are holding iron firm at 1.45c for grooved and 1.50c for sheared. Steel skelp is held at 1.40c to 1.45c.

Muck Bar.—We note the sale of 100 tons of muck iron at $25 Pittsburg. The market generally continues quiet.

Rails and Track Material.—It is reliably reported that that Republic Iron & Steel Co. will install a rail mill at Youngstown, O. With the increased steel producing capacity there, a rail mill with a daily output of about 1,000 tons can be taken care of. Light rails are easier and further reductions have been made in prices. We revise quotations as follows: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; 16 and 20 pounds, $26.50 to $27; 25 to 40 pounds, $25 to $25.50. Track material: Spikes, 1.95c to 2c; track bolts, square nuts, 2.25c to 2.30c; hexagon nuts, 2.40c to 2.45c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 1.80c to 1.85 is asked.

Plates.—The plate tonnage is growing slightly and the mills in this district have increased their operations to some extent. We make the following quotations: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flang and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2. 10c, and it ranges in price to 3c Plates more than 100 inches, 5c extra 100 pounds. Plate 316-inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are base 1 on carload lots, with 5 extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Structural Materal.—Some small business continues to be taken by local mills, but as yet none of the large orders that are being figured on are being closed. A number of large buildings, including the new Frick building opposite the present Frick structure and the Carnegie Technical School are to be erected in the spring. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c

Bars.—While the tonnage continues small the number of orders for bars, especially from the West, is increasing. Bar iron is weak and there is little demand. We make the following quotations: Bessemer steel bars, 1.30c; open-hearth, 1.40c; plow beams and cultivator beams, 1.30c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.40c; common bar iron, 1.30c to 1.35c Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Hoops are quoted at 1.65c, full extras, in 250-ton lots and over, and 1.75c in less than 250-ton lots. Bands are quoted at 1.30c and take the bar extras.

Sheets.—At the special convention of sheet workers to be held in this city next Tuesday the limit of output in all Amalgamated mills will be removed. However, in order to compete with the non-union mills of the American Sheet Steel Co. a reduction in wages of about 20 percent must also be allowed the independent manufacturers by the Amalgamated Association. We make the following quotations on black sheets in 500-bundle lots and over: No. 28, 2.35c to 2.40c; No. 27, 2.25c to 2.30c; No. 26, 2.15c to 2.20c; Nos. 22 and 24, 2.05c to 2.10c; Nos. 18 and 20, 2c to 2.05c; Nos. 14 and 16, 1.85c to 1.90c; Nos. 10 and 12, 1.75c to 1.80c. Galvanized, Nos. 10 to 17, 2.40c to 2.45c; Nos. 17 to 22, 2.60c to 2.65c; Nos. 22 to 25, 2.80c to 2.85c; Nos. 25 and 26, 3c to 3.05c; No. 27, 3.20c to 3.25c; No. 28, 3.40c to 3.45c; No. 29, 3.80c to 3.85c; No. 30, 4.20c to 4.25c.

Pipes and Tubes.—No concessions from current discounts are being allowed by the National Tube Co., although independent mills are making concessions from 2½ to 5 percent. Trade in heavy pipe has fallen off considerably, although there is a fair tonnage in the merchant sizes. We quote as follows in carload lots to consumers, f. o. b. Pittsburg, plus freight according to Tube Rate Book to destination:

MERCHANT PIPE.

	Steel Pipe.		Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57

¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Extra Strong Plain End				
⅛ to 8 inch	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End				
⅛ to 8 inch	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	35
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

Wire and Wire Nails.—A fair demand continues for wire nails and all wire products, and despite the depression in other finished steel lines the wire and wire nail trade holds up well. The demand for both iron and steel cut nails has fallen off to a great extent but agreed prices are being maintained. We make the following quotations: Wire nails, carload lots, to jobbers, f. o. b. cars Pittsburg, $1.90 to $1.95; plain wire, carload lots, $1.85 to $1.85; barb wire, carload lots, $2.20 to $2.25; staples, carload lots, $2.10 to $2.15. Galvanizing, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $1.90, and less than carload lots, $1.95, f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2 in carload lots and $2.05 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

Merchant Steel.—The volume of business continues small, consumers buying to cover immediate requirements only. We quote: Turned, cold rolled and ground shafting, 52 off in carload lots and 47 percent off in less than carload lots. Tire steel, 1.70c to 1.80c; spring steel, 2.15c to 2.20c; toe calk, 2.15c to 2.20c. Tool steel is quoted 7 cents and upwards, according to the grade.

Old Material.—Cast scrap continues active, but other lines of old material are in little demand. Mills are not buying melting stock and dealers are stocking up for higher prices. We make the following quotations, gross ton: Old steel rails, including those for re-rolling purposes, $13.50 to $14; car wheels, $11 to $12; iron car axles, $17 to $18; steel melting stock, $11 to $11.50, low phosphorus stock, $15.50 to $16; No. 1 wrought scrap, $12 to $13; wrought turnings, $7 to $8; No. 1 machinery cast, $12.50 to $13; castiron borings, $5 to $5.50; cast scrap, $12.50 to $13.

Coke.—While further meetings of the committee appointed by the coke producers will be held for the purpose of formulating a plan to hold prices, it is doubtful if any plan can be successfully carried out owing to the withdrawal from the arrangement of several large independent producers. The H. C. Frick Coke Co. is now seeking the furnace as well as the foundry trade and will hereafter offer in the open market about 3,000,000 tons of coke annually. Prices remain unchanged at $2.25 to $2.40 for foundry and $1.60 to $1.75 for furnace coke. At the present time, in the upper and lower Connellsville region, about 50 percent of the entire capacity is in operation. The production of the entire region for the week ending Saturday, Nov. 21, dropped to about half of the record output, the upper region producing 109,360 tons and the lower 44,000 tons. In the two regions 11,288 ovens were out of operation.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, Dec. 1.

In some finished materials and even in pig iron, a better tone is evident. Steel bars have been quite active during the week; plates have improved; sheet business is larger; light rails are active, and pig iron is measurably stronger. Sellers are in a more optimistic frame of mind just now than they have been for some months, and there are not a few who believe that in respect to the iron and steel trade, December will pass into history with a reputation similar to the going out of March when that month has been ushered in with mildness. There are still plentiful weak points in the market, but a feeling of confidence seems to be returning and when makers of scrap take a firmer position—which is now the attitude of some railroads in this material—it is significant that they believe that the time has come for at least a turn. Bar iron is probably the weakest product in this market and there seems to be no bottom to it. The scarcity of orders is illustrated by the fact that on a recent inquiry for about 250 tons practically every producer between Pittsburg and Chicago bid. Specifications are almost as hard to obtain as orders and many mills are operating only part time, in consequence. On steel bars, all the leading producers are guaranteeing the price against declines, though one interest is stipulating in such contracts that the buyer must also take the risk of paying on the unshipped portion any advances that might be made during the life of the contract. Wire products are weak, and while the leading producer has not announced any change in quotations it is meeting the cuts on nails and barbed wire made by independent interests. Structural steel is without animation, transactions being limited to lots from warehouse stocks. The inquiry for heavy rails for 1904 delivery continues, though from the way in which they disappear after being quoted on, it would appear that they are largely from parties who wish to sound the market. Pig iron is firmer. While one round lot was closed last week on the basis of $9, Birmingham, sellers are generally uniting on $9.25 for No. 2 as the basis on which they are willing to transact business for nearby deliveries. Only two months' grace is given in which to ship iron closed at this figure, producers asking 25 cents a ton more for deliveries extending beyond this period. Coke is quiet and standard 72-hour Connellsville is quoted $2.65 at the ovens.

Pig Iron.—There has been active buying of pig iron during the week in lots from 100 to 500 tons and the inquiry contiues unabated. A notable feature of this trading is that the bulk of these transactions are with moderate sized foundries which as a general rule put off their purchases until the last moment in the hope and fear that the market might go lower. The bulk of these orders have been closed at $9.25, Birmingham, for No. 2 foundry, which is the price ruling in this market on nearby deliveries. There is evidence that a number of foundrymen have given up the idea of covering at $9, and while there may be many still holding out an increasing number is coming into the market with bona fide orders to place at the best figure they can obtain, which at present is the above named quotation. A lower price has been made during the week to a consumer in Milwaukee who placed an order for 2,500 tons of No. 3 at what is equivalent to $8.50 Birmingham. More iron has been sold at $9.25, however, and at this price the market is stronger. The same Milwaukee buyer also placed an order for 2,500 tons of Northern grades, and a good sized tonnage of basic iron was also moved during the week to a local consumer. There is a better demand for Northern irons than for some time past, the market being firmer all along the line. Our quotations are as follows:

Lake Superior Charcoal	$16 50 to 17 00
Northern Coke Foundry No. 1	15 00 to 15 50
Northern Coke Foundry No. 2	14 50 to 15 00

Northern Coke Foundry No. 3	14 00 to 14 50
Northern Scotch Foundry No. 1	15 50 to 16 00
Ohio Strong Softeners No. 1	16 80 to 17 30
Ohio Strong Softeners No. 2	15 80 to 16 30
Southern Coke Foundry No. 1	13 35 to 13 85
Southern Coke Foundry No. 2	12 85 to 13 35
Southern Coke Foundry No. 3	12 35 to 12 85
Southern Coke Foundry No. 4	11 80 to 12 35
Southern Gray Forge	11 55 to 11 80
Southern Mottled	11 30 to 11 55
Southern Silveries (4% to 6% Silicon)	15 35 to 16 35
Jackson Co. Silveries (6% to 10% Silicon)	18 30 to 20 30
Alabama and Georgia Car Wheel	19 85 to 20 85
Malleable Bessemer	14 75 to 15 25
Basic Iron	13 35 to 14 35

Bars.—There is an increased demand for steel bars, a number of season contracts having been closed during the week, including one for 3,000 tons. Specifications are also heavier, many consumers taking the full quotas on their contracts. The buying is yet far from the full capacity of consumers' plants, but it is considerably better than during October or the first part of November. Many buyers are still unconvinced as to the stability of the market and are insisting on a guarantee against declines in their contracts. Iron is dull and weak, demand being reduced to a minimum. There is no change in prices, and we quote mill shipments, carload lots, Chicago delivery: Iron, 1.35c to 1.45c; soft Bessemer steel, 1.46½c; angles, less than 3 x 3, 1.56½c, base half extras; hoops, 1.91½c (in lots of 250 tons and greater, 1.81½c rates, full extras). Jobbers' quotations on carloads and less: Iron, 1.65c to 1.75c; steel, 1.60 to 1.70c; small angles, channels and tees, less than 3 x 3, 1.70c to 1.80c; hoops, 2.10c rates, full extras.

Sheets.—Trading is brisk though limited to small lots. Not so much is heard of cut prices from independents since the drastic cut two weeks ago by the leading interest, and the market is consequently easier. Galvanized is the only weak spot, and both mill and warehouse prices have been lowered during the week. We quote mill shipments, carload lots, Chicago delivery: No. 27 gauge, black, 2.51½c to 2.56½c; No. 28 black, 2.61½c to 2.66½c; galvanized, No. 27 gauge, 3.41½c to 3.46½c; No. 28, 3.61½c to 3.66½c. From warehouse stocks, we quote, black sheets, No. 16, 2.45c; Nos. 18 and 20, 2.55c; Nos. 22 and 24, 2.60c; No. 26, 2.70c; No. 27, 2.80c; No. 28, 2.90c. Galvanized from store, 75 and 7½ percent.

Plates.—Buying is better, and the leading local interest has closed a good tonnage. There is no change in prices, and we continue to quote mill shipments, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c; flange steel, 1.85c. From store, we quote small lots: Tank steel, ¼-inch and heavier, 1.90c to 2c; 3-16, 2c to 2.10c; No. 8, 2.10 to 2.20c; No. 10, 2.15c to 2.25c; flange steel, 2.25c all f. o. b. warehouse.

Structural Steel.—Mills report that business is extremely quiet, and from store only a light trade is being done in small lots. We quote mill shipments, Chicago delivery, as follows: Beams and channels, 16 inches and under, 1.76½c; 18 inches and over, 1.86½c; universal plates, 1.75c; angles, 3 x 3 and larger, 1.76½c; tees, 3 x 3 and larger, 1.81½; zees, 1.76½c. On lots from store, we quote beams, channels and angles, 3 x 3 and larger, 1.90c rates; 18, 20 and 24-inch, 10 cents extra; tees, 1.95c rates.

Merchant Pipe.—A good sized tonnage has been booked during the week by the leading interest, and jobbers also report a brisk trade. There has been some cutting of prices by independent producers, but it has not affected the trade materially. Prices are unchanged, and we quote carload lots to consumers, mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ¾ inch inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	70.35	60.35
7 to 12 inches inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ percent advance over above prices.

Merchant Steel.—New business is of good proportions and specifications keep up remarkably well. We quote mill prices, Chicago delivery: Spring steel, 2c; sleigh shoe, flat sizes, 1.60c; concave and convex, 1.75c; cutter shoe, 2.20c to 2.30c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.05c. Ordinary grades of tool steel, 6c to 8c; specials, 12c and upwards. Cold rolled shafting in carload lots, 52, and in less than carload lots, 47 percent discount from list.

Boiler Tubes.—Jobbers have done the larger part of the business transacted in the past week, which has been confined largely to small lots. Mills report conditions quiet. Prices are without change. We quote carload lots from mill, Chicago delivery, as follows:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ in.	40.85	37.35	53.35
1¾ to 2½ in.	53.85	36.35	40.35
2¾ to 5 in.	59.35	49.35	} Up to 4 inches.
6 to 13 in.	53.85	36.35	} 48.35

For car lots or less, direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ in.	40	35	37.50
1¾ to 2½ in.	50	32.50	35
2¾ to 5 in.	57.50	42.50	} Up to 4 inches.
6 to 13 in.	50	32.50	} 45

Cast Iron Pipe.—An improvement is noted in the demand for small lots, notwithstanding that consumption always falls off in the winter months. Prices are lower than a week ago, and we quote carload lots, f. o. b. Chicago, 4-inch pipe, $28; 6-inch and upwards, $27; gas pipe $1 a ton higher.

Rails and Track Supplies.—Inquiry for light rails continues heavy and a good tonnage has been booked during the week. Interest is also increasing in standard sections, and a large tonnage is represented in the inquiries for 1904 deliveries. Much of this is from parties sounding the market however, who have no intention of buying at the present time, and their inquiries are usually withdrawn as soon as quoted upon. We quote standard sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than car lots, $32; second quality rails, $27; 25-pound rails, $28 to $30; 12-pound rails, $30 to $32, with regular differentials for intermediate sizes. Track supplies, mill shipments, angle bars, 1.80c to 1.90c; spikes, first quality, 1.95c to 2c (out of store, 2.10c to 2.20c rates); second quality, 1.65c to 1.75c; track bolts, 3½ x ¾, with square nuts, 2.70c to 2.80c per 100 pounds; (from store 2.90c) with hexagon nuts, 2.85c to 2.95c (from store 3.05c), with usual differentials for other sizes.

Wire and Wire Nails.—Independent producers are cutting prices on nails and barbed wire, and the leading interest is meeting same. It has not yet, however, reduced its quotations, though there is considerable talk that some such action may be taken soon. We quote prices to jobbers, Chicago delivery, as follows: Wire nails, carload lots, $2.15; less than carload lots, $2.20. Cut nails, steel, carload lots, $2.05; less than carload lots, $2.10. Plain wire, $2.05 carloads, and $2.15 in smaller lots; galvanized plain wire, carloads, $2.35; smaller lots, $2.40. Painted barb wire, carloads, $2.45; less than carloads, $2.50; galvanized, carloads, $2.75; less than carloads, $2.80; staples, carloads, $2.30; smaller lots, $2.35; galvanized, carloads, $2.70; smaller lots, $2.75. Bale ties, 82½ and 5 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or De Kalb with actual freight allowed not exceeding 50 cents per 100 pounds.

Coke.—Demand is weak and the market is without life. Standard 72-hour Frick coke is held firm at $2.65 at the ovens; other brands of Connellsville coke can be bought as low as $2.35. New River and Pocahontas brands range from $5 to $5.25, Chicago.

Old Material.—The most notable feature of the situation is the attitude of railroads who are holding their material for better prices. The market is quiet and sales are limited in their tonnage and volume. We quote dealers' selling prices, gross tons, as follows:

Old iron rails	$14 00 to 14 50
Old steel rails (mixed lengths)	9 00 to 9 50
Old steel rails (long lengths)	10 50 to 11 00
Relaying rails	23 00 to 24 00
Old wheels	11 50 to 12 00
Heavy melting steel	9 00 to 9 50
Mixed country steel	7 00 to 7 50

The following are selling prices for net tons:

No. 1 R. R. wrought	$10 00 to 10 50
No. 2 R. R. wrought	8 50 to 9 00
Shafting	11 00 to 11 50
Dealers' forge No. 1	9 00 to 9 50
No. 1 busheling and wrought pipe	7 50 to 8 00
No. 1 cast	10 50 to 11 00
Heavy cast (300 pounds and over)	8 00 to 8 50
Agricultural malleable	9 00 to 9 50
Iron axles	14 00 to 14 50
Steel axles	11 50 to 12 00
No. 1 boilers, cut	7 50 to 8 00
Cast borings	3 00 to 3 50
Mixed borings, etc.	3 00 to 3 50
Wrought turnings	6 00 to 6 50
Machine shop turnings	6 00 to 6 50
Iron axle turnings	6 50 to 7 00
Steel axle turnings	6 00 to 6 50
Stove plate and light cast scrap	8 50 to 9 00
Old iron splice bars	10 50 to 11 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 1.

The interesting feature of the market this week has been the discussion of the contracts which the Pennsylvania Railroad Co. expects to make for 240,000 tons of castings for use in the great tunnel to be built at the New York terminus. Otherwise, little of importance has developed. The shipping of ore, with the exception of a few cargoes yet to come down, is ended. There has been a rumor afloat that one of the large vessel interests is to be consolidated with the steel corporation fleet, but it is pronounced absurd by those in a position to know.

Pig Iron.—The downward tendency of Southern iron has been checked, and while it is probably true that a large tonnage for prompt shipment might be purchased on a basis of $9 for No. 2, Birmingham, the usual price is now $9.25, and some brands cannot be had under $9.50. Northern furnacemen declare that $13.50 at the furnace is as low as they can go without selling below cost and that they will blow out rather than operate at a loss. A number of inquiries have been received from foundrymen who expect to bid on furnishing a part of the castings for the Pennsylvania Railroad tunnel, it being understood that the company intends to divide the tonnage among a score or more foundries. The inquirers state that, as the castings are to be delivered over a period of five years, prices on pig iron for that time are desired. Sellers are reluctant to quote prices for more than a year and many prefer not to quote for more than six months. It has been suggested that contracts might be made for iron to be paid for at prices prevailing at time of delivery, but there are objections to this plan, as it would not permit founders to make definite bids on the castings. It is not yet clear which kind of an agreement will be decided upon. Selling agents are conferring concerning the matter with the companies which they represent. We quote as follows for Cleveland delivery, save on Northern gray forge, which is at Valley furnace:

Bessemer	$15 10 to 15 35
No. 1 Strong Foundry	14 75 to 15 25
No. 2 Strong Foundry	14 00 to 14 50
No. 3 Foundry	13 75 to 14 25
No. 2 Southern	12 85 to 13 35
Gray Forge, Valley furnace	12 75 to 13 00
Gray Forge, Southern	11 85 to 12 00
Lake Superior charcoal	16 50 to 17 00

Finished Material.—Buyers are still waiting and endeavoring to obtain concessions. The contest between iron and steel bars continues. While the price of steel is 1.30c for Bessemer and 1.40c for open-hearth, Pittsburg, iron is ordinarily quoted at 1.30c at the mill and sellers have sometimes found it necessary to make a price very near 1.25c, Youngstown, in order to meet competition from local mills. There is a feeling in some quarters that, in order to increase the sale of steel bars, it will be necessary to quote a delivery price and not continue the long established custom of quoting on a Pittsburg basis. Competition on sheets continues and very little business is being done. We quote mill sales of black sheets as follows: No. 10, 1.75c; No. 11-12, 1.80c; No. 14, 1.85c; No. 16, 1.95c; No. 27, 2.30c; No. 28, 2.40c. Galvanized, 75, 10 and 7 off. Out of stock, prices are as follows: No. 10, 2.10c; No. 12, 2.15c; No. 14, 2.20c; No. 16, 2.30c; No. 18-20, 2.40c; No. 24, 2.45c; No. 25-26, 2.50c; No. 27, 2.55c; No. 28, 2.65c; No. 30, 3.10c. Galvanized, out of stock, No. 16, 75 and 7½ off; No. 18-20, 75 and 10 off; No. 22-28, 75, 10 and 2½ off.

Old Material.—Business has been very dull. Many companies and small concerns which have scrap on hand are holding it in the hope that higher prices will prevail after the first of January. Prices are lower on old iron rails, steel boiler plates, malleable agricultural iron, wrought turnings, wrought iron boilers, grate bars, pipes and flues, tank iron, hoop and band iron, sheet iron, wrought drillings and stove plate. We quote the following gross tons, Cleveland:

Old iron rails	$15 00 to 16 00
Old steel rails (over 6 feet)	10 00 to 11 00
Old steel rails (6 feet and under)	11 00 to 12 00
Old car wheels	13 00 to 14 00
Steel boiler plates	9 00 to 10 00
Malleable iron (railroad)	11 00 to 12 00
Malleable iron (agricultural)	9 00 to 10 00
Heavy steel	9 00 to 10 00

We quote the following net tons:

No. 1 R. R. wrought	$11 50 to 12 00
Mill scrap	10 00 to 11 00
No. 1 machine cast scrap	10 00 to 11 00
Iron axles	15 00 to 16 00
Axle turnings	9 00 to 10 00
Wrought turnings (free from cast)	6 00 to 7 00
Uncut wrought iron boilers	5 00 to 6 00
Grate bars	6 00 to 7 00
Pipes and flues (clean)	8 00 to 9 00
Tank iron	8 00 to 9 00
Hoop and band iron	5 00 to 6 00
Sheet iron	4 00 to 5 00
Wrought drillings	6 00 to 7 00
Stove plate	8 50 to 9 00
Steel axles	13 00 to 14 00
Cast borings	2 50 to 3 00

CINCINNATI.

Dec. 1.

The Southern pig iron market continues to show a steady tone and the activity in demand holds up well. An important development of the week is the taking out of the market the entire surplus of the Sloss-Sheffield Steel & Iron Co. which has been held up prominently for a long time as one of the depressing influences. It is reported that at a meeting of the directors of the company there was a difference of opinion as to whether the iron on hand should be forced on the market at the best price obtainable or held for at least the present market value. The result was that a few of the directors formed a syndicate and bought outright from the company the entire surplus stock of iron on hand which amounted to 75,000 or 80,000 tons. This syndicate it appears has faith in the market and will hold the iron thus purchased until it can be sold to advantage.

It is reported here that the Tennessee Coal, Iron & Railway Co. directors at a meeting this week decided that no iron should be sold below $9.25, Birmingham.

One of the large furnace companies in the South is reported to have shipped out 40,000 tons in November and made 30,000 tons.

Pig Iron.—The market has held steady and the lowest price now heard in the trade is $9.25, Birmingham. Several large inquiries are under consideration with one buyer willing to buy for the first half of the year if $9 is obtainable. A number of buyers are now offering to take iron at $9 Birmingham, but sellers are not naming under $9.25. The run of daily business is fairly good and the orders show more of the 200 to 500-ton lots than was the rule a short time ago. The large pipe manufacturer that took a heavy tonnage last week is again in the market and is inviting offers of iron but there is no tonnage specified in the inquiry. Sellers have more confidence in the situation than for some weeks. Nearly all of the furnace agents have iron to sell at $9.25 and this puts them on a competing basis and the ability to quote with some confidence that they are in line as to price is a more satisfac-

tory condition than has prevailed in a long time. The feeling in the trade seems to be one of satisfaction that prices have steadied. We quote f. o. b. Cincinnati:

Southern Foundry No. 1	$12 50 to 13 00
Southern Foundry No. 2	12 00 to 12 25
Southern Foundry No. 3	11 50 to 11 75
Southern Foundry No. 4	11 25 to 11 50
Southern Foundry No. 1 soft	12 50 to 13 00
Southern Foundry No. 2 soft	12 00 to 12 25
Gray forge	10 75 to 11 25
Northern Foundry No. 1	15 65 to 15 90
Northern Foundry No. 2	15 15 to 15 40
Northern Silvery (8% silicon)	18 65 to 19 15
Southern car wheel iron	19 00 to 19 75

Finished Material.—The market continues quiet with buyers taking only what their immediate requirements call for. Bar iron is still easy and unsettled and it is reported that the sheet situation is easier as prices from independent mills have been reported that look low but these quotations have not yet been heard with sufficient frequency to unsettle current values. The undertone is weak, however, all through the list and buyers are cautious. For bar iron a quotation of 1.41c Cincinnati is now an open price on car loads. Steel bars are quoted 1.43 base, half extras, with the retail price 1.90c for iron and steel out of store. Galvanized sheets are being quoted at 75 and 10 and 5 and 2½ percent off. We quote black sheets, No. 27, at 2.45c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.90c; No. 27, 2.80c; No. 16, 2.55c; No. 14, 2.45c; No. 12, 2.35c; No. 10, 2.30c. Tank plates are easy and sell out of store at 2c for ¼-inch and 2.10 for 3-16-inch. Beams and channels are quoted at 1.90c to 2c from stock, and angles at 1.90c to 2c for base sizes.

In merchant pipe there is no quotable change in values and trade is fair. Buyers are expecting price reductions in line with other manufactured products, and are deferring purchases accordingly.

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed. Wrought Iron Pipe. Black. Percent.	Guaranteed. Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	63.7	53.7
½ inch	68.7	58.7	65.7	55.7
¾ to 6 inch, inclusive	73.7	63.7	70.7	60.7
7 to 12-inch, inclusive	67.7	57.7	64.7	54.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	37.7
1¾ to 2½ inch	54.2	36.7
2¾ to 5 inch	59.7	46.7
6 to 13 inch	54.2	36.7

Old Material.—The smaller dealers are quoting irregularly and the larger dealers are holding off for better conditions. There is no distinct change in the market. We quote:

Old No. 1 railroad wrought, net tons	$12 00 to 12 50
Cast machine and foundry, net tons	11 00 to 11 50
Old iron rails, gross tons	17 00 to 18 00
Old steel rails, gross tons	13 00 to 14 00
Old short lengths, gross tons	13 50 to 14 50
Old iron axles, net tons	15 00 to 16 00
Stove plate, net tons	9 00 to 9 50
Wrought turnings, net tons	11 00 to 11 50
Cast borings, net tons	6 00 to 6 50

PHILADELPHIA.

Dec. 1.

The slight improvement noted last week, due rather to decreased production than to increased demand, has been maintained. The average curtailment of about one-third has relieved an overloaded market and added firmness which otherwise would have been entirely lacking. Railroads are showing large earnings even compared with last year and general conditions outside of the iron and steel business are favorable.

Pig Iron.—There is some activity and a better feeling is noticeable. Sellers are less disposed to make concessions and buyers are more inclined to place orders, but there is no decided improvement. Labor costs are being adjusted and it is believed that the efficiency of the workingmen will be increased, because they know that to ensure employment they must work faithfully. Many have been careless during the period of great prosperity. Sales in small lots are being made at $15 to $15.50 for No. 2 X foundry and $13.50 to $14 for standard mill irons. Southern brands can be had at $13.25 to $13.50. We quote as follows: No. 2 X foundry $15 to $15.50; No. 2 plain, $14.50 to $14.75; standard gray forge, $13.75 to $14.25; ordinary gray forge, $13.25 to $13.50; Southern No. 2 X rail shipment, $13.25 to $13.50; Southern No. 2 X on dock, $12.75 to $13.

Finished Material.—The market remains about the same, sales being about two thirds of what they were a year ago. We quote: Plates, ¼-inch and thicker, 1.75c to 1.80c; beams, angles and channels, 1.75c to 1.80c; small angles, 1.50c to 1.60c; steel bars, 1.45c to 1.50c; refined iron, 1.40c to 1.45c.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, No. 150 NASSAU ST., Dec. 1.

Pig Iron.—Some good sized orders have been placed the past week in Southern irons, which have again shown nearly all of the activity that has prevailed. Various prices are heard for Southern No. 2 foundry, ranging all the way from $9 to $9.50 Birmingham. As for the lower figure, no sales agent here will stand for it; neither can the higher figure be quoted as the market, although one large interest says it will not close contracts for less than several hundred tons below that figure. The market is about $9.25, especially for lots of 200 to 500 tons. Wherever a sale is made, immediate shipment is requested. Southern furnaces are not in a position to meet expectations in this direction, the car shortage apparently being worse than ever. We know of a Boston order for a few hundred tons given six weeks ago, which has not yet been delivered, although quick shipment was urgently requested when the contract was made. The market for Northern irons is extremely quiet, and very few sales are reported. Prices are irregular, especially for No. 2 X, for which some furnaces are quoting as low as $14.50 tidewater, whereas others ask as high as $15.50. Some Pennsylvania furnaces may be said to be out of the market, since they are making no effort to get business, claiming that it is unprofitable at present prices. Foundrymen are awaiting with interest the award of the Pennsylvania tunnel contract, bids for which will be opened on Dec. 15, as we have already stated. They are anxious to know the amount of castings that will be needed. Estimates are from 200,000 to 300,000 tons. New York pig iron prices are as follows: Northern No. 1 X, $15.25 to $15.75; No. 2 X, $14.50 to $15.50; No. 2 plain, $14.25 to $15; Southern No. 1 foundry, $13.25 to $13.75; No. 2 foundry, $12.75 to $13.25; No. 3 foundry, $12.25 to $12.75; No. 4 foundry, $11.75 to $12.25.

Finished Iron and Steel.—The entire finished material market presents only a fair degree of activity. In structural shapes a waiting policy is in evidence, but to offset this the number of new propositions shows a most gratifying increase. The closing of contracts is contingent upon the money situation, any improvement in which is certain to result in some excellent business. During the week the American Bridge Co. booked a 2,000-ton order from the Chicago, Rock Island & Pacific railroad for bridge work. Bar iron is quiet, and only a limited tonnage has been placed. In plates, there is nothing of interest to report, and only a fair trading can be noted. Sheets are moderately active, with mills anxious to book orders. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 1.75c to 1.80c; flange, 1.85c to 1.90c; firebox, ordinary, 1.95c to 2.00c; refined iron bars, 1.40c to 1.45c; soft steel bars, 1.40c to 1.50c; steel sheets, in carloads, New York, No. 28 black, 2.50c to 2.70c; galvanized, 75 and 10 to 75 and 5 off.

BIRMINGHAM, ALA.

Dec. 1.

Southern iron makers take a decidedly more cheerful view of the situation this week, and while there has been practically no change in the market as to prices, there has been a con-

tinued demand for prompt shipment, and with the large sales recently booked by some of the chief interests here, it is expected that the accumulation on the furnace yards will soon be wiped out. The pipe manufacturers have been heavy buyers the past two weeks, while there is at the same time a good demand from the agricultural implement makers in the West. One still finds a considerable variation in prices, but this is chiefly accounted for by difference in brands and as to whether the metal offered carries high or low silicon, etc. There is marked tendency on the part of consumers now to pay more attention to the question of analysis than heretofore, many buying altogether by analysis, regardless of fracture grade. This makes it exceedingly difficult to make any exact quotations. We quote as follows:

1 Foundry	$ 9 50 to 10 00
1 Soft	9 50 to 10 00
2 Foundry	9 00 to 9 50
2 Soft	9 00 to 9 50
3 Foundry	8 50 to 9 00
4 Foundry	8 25 to 8 50
Gray Forge	8 00 to 8 25
Mottled	7 75 to 8 00
Alabama car wheel, all grades	16 00 to 17 00

There are at least 10 furnaces out of blast in the district which were making iron a year ago, against one entirely new in blast and three overhauled with increased capacity.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*, ROOM 1909, NO. 150 NASSAU ST., Dec. 1.

Pig Tin.—As compared with this time a week ago, prices are up about ⅝c, but only moderate activity still prevails. Only where there are urgent needs to be met do buyers come in the market. The London market during the week has been very strong, spot having advanced £2 7s 6d since we last quoted it, while futures are higher proportionately. The November statistics, compiled by Secretary D. Mayer, of the Metal Exchange, show the total world's visible supply to be 15,195 tons, against 18,346 tons at the same time a year ago, while deliveries have been 2,500 tons, and arrivals 1,962 tons. Today's closings at the Metal Exchange were as follows: Spot to December, 25.70c to 26c. London's closings today follow: Spot, £118 7s 6d; futures, £119 12s 6d.

Copper.—Depressing conditions continue and as a result, the official prices suffered a reduction of ⅝c in Lake, ⅞c in electrolytic, and ¾c in casting, since we last quoted them. The demand shows no improvement whatever from local sources, but foreign buying was a little more active. The London market during the week has been dull, with prices showing a reactionary tendency. The statistics for November estimate the exports at 14,522 tons, making the total exports for the first eleven months of the present year 122,503 tons, against 153,315 tons for a similar period last year. Today's closings at the Metal Exchange were as follows: Lake, 12¼c to 12⅜c; electrolytic, 12⅛c; sellers and casting, 12c. London's closings today follow: Spot, £55; futures, £54 10s.

Lead.—Spot is scarce, and commands 4¼c. St. Louis is lower at 3.97½c, and London higher at £11 3s 9d.

Spelter.—Spot supplies are light, and sell at 5.40c, with December lower at 4⅞c. St. Louis is 4.50c, a decline of 25 points since our last report. London is unchanged at £20 12s 6d.

Antimony.—Cookson's is 7¼c, Hallett's 6¼c, and outside brands 5¾c.

Quicksilver.—Is quoted at $46.50 to $47.50 per flask of 76½ ponds in lots of 100 flasks. London is £8 5s.

Nickel.—Is selling at 40c to 47c for large lots down to a ton, and 50c and 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*, 1115 MONADNOCK BLOCK Dec. 1.

Demand for metals keeps to moderate proportions, buyers continuing the policy of purchasing in small lots. There are no changes in prices and we quote Chicago delivery from jobbers: Lake copper, carload lots, 13c; smaller quantities, 13¼c; casting, 13c to 13¼c. Pig tin, carload lots, 26c; lesser lots, 27c. Pig lead, 4.10c in 50 to 100-ton lots, and 4.35c to 4.50c in smaller quantities; sheet zinc, 6.75c; antimony, 7¼c to 7¾c, for both Cookson's and Hallett's.

Old metals continue in fair demand without change as to price. We quote dealers' selling prices as follows: Copper wire, $11.50 to $11.75; heavy copper, $11.25 to $11.50; light copper, $10.50 to $10.75; red brass, $10 to $10.25; red brass turnings, $8.50 to $8.75; yellow brass, $7.50 to $7.75; yellow brass turnings, $6.50 to $6.75; lead, $3.90; zinc, $4.25; pewter, $17.

NEW PRESIDENT OF THE A. S. M. E.

At the meeting of the American Society of Mechanical Engineers at New York this week, announcement was made of the canvass of the vote for president for the ensuing year, which shows the election of Ambrose Swasey, vice president and treasurer of the well known Warner & Swasey Co., of Cleveland. This is a well deserved honor and follows by but a few years a similar bestowal upon W. R. Warner, president of the Warner & Swasey Co.

AMBROSE SWASEY.

Mr. Swasey is a native of New England and was born in Exeter, N. H. He attended the district school and at 18 became an apprentice to the machinist's trade. In 1870, in company with Worcester R. Warner, he entered the employ of the Pratt & Whitney Co., at Hartford, Conn., and while in charge of their gear department invented and perfected the epicycloidal milling machine for the production of the true theoretical teeth of gears. Mr. Swasey subsequently invented a new process for generating and cutting the teeth of spur gears and exhibited at the World's Fair an automatic gear cutting machine embodying the principles of the invention. In 1880 he resigned his position with the Pratt & Whitney Co. and with Mr. Warner established the Warner & Swasey Co. in Cleveland. Mr. Swasey's ability as a mechanical engineer, combined with Mr. Warner's taste for astronomical pursuits, led the firm to take hold of the manufacture of the mathematical instruments utilized in astronomy. The Lick telescope in California, the meridian circle and equatorial instruments at the Naval Observatory at Washington, and the Yerkes telescope at Lake Geneva, Wis., are specimens of their skill placed at the service of the astronomer. Mr. Swasey is a past president of the Civil Engineers' Club of Cleveland, a charter member of the American Society of Mechanical Engineers, and has had the title of Chevalier of the Legion of Honor conferred by the French Government.

The Van Dorn & Dutton Co., Cleveland, reports that its business has held up remarkably well considering the general condition of business. It adds: "While we could do more work than we have to do at the present time, still we are now in condition to give our customers better satisfaction by more promptly filling their orders than we could when we were in an over-crowded condition, as we were in most of the time during the last two years. If business holds as good with us as it is now we will be satisfied."

By agreement of all parties interested, P. Eckert Slaymaker, of Lancaster, Pa., and C. C. Kaufman, of Columbia, Pa., have been appointed receivers of the Susquehanna Iron & Steel Co., of Columbia, Pa., with blast furnaces at Wrightsville, Pa., and Vesta, Pa., and rolling mills at Columbia and York, Pa.

The fate of the reorganization plan for the Consolidated Lake Superior Co. is in doubt and may be decided this week. It is understood that only about one-half for the amount provided for by the plan has been subscribed.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.

ROSE BUILDING, CLEVELAND, OHIO.

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JOHN A. PENTON, Vice-President,
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PITTSBURG: 429 Park Building, A. O. BACKERT, Manager.
NEW YORK: 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST: R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

DECEMBER 3, 1903

STEEL EXPORTS AT CUT PRICES.

It is interesting to note the sympathy with the railroads expressed by journals that find fault with the efforts of steel manufacturers to secure an export outlet for their surplus product. It is thought strange that the railroads should grant the request for reduced freights to the seaboard on export steel sold below the domestic price, while the same railroads are still charged $28 a ton for their rails. It may be that the railroads need to be cautioned against the impositions of the wicked rail manufacturers, but we scarcely believe they will want any credit for benevolent intentions in any step they take to secure business. The railroad managers were in the same position as the steel manufacturers—they could either offer to carry export steel at a figure that would make exports possible or do without the business.

As for any objection to American manufacturers of steel or any other product quoting a price abroad that nets less at works than domestic business, railroad managers are the last persons to make it. If there are anywhere past masters in the business of readjusting ordinary and natural conditions by decree, railroad officials have that distinction. The coal operator in a field close to Lake Erie port, for example, pays a freight rate that takes away the advantage his proximity gives him over operators from more distant fields; similarly the thin-vein mine must have consideration so that it does not suffer in the market in competition with the thick-vein mine. And when new producers would enter the field, the railroads, in the interest of those who have long furnished them freight, become at once an important factor in the case. By the construction or the refusal of switches at the outset, or, once the new enterprise is started, by regulating the supply of cars, the railroad artificially adjusts many questions that in the view of theorists admit of but one solution as problems in economics.

But putting aside the railroads' interest in having as low a price for rails at the mill as the foreign buyer gets, what would those who attack American steel manufacturers have them do? When orders at home are not up to the capacity of works, are they to shut down the excess capacity and throw idle every man not needed to get out domestic orders? Is the refusal to entertain foreign business at the price that must be named to get it a virtue, and the quoting of anything less than the home schedule an offense for which every manufacturer who commits it is to be pilloried? Calculate the difference between having the million tons of steel which the largest home interest is likely to export in the next twelve months, rolled in the United States and having it go to the mills of foreign competitors. Begin at the Lake Superior mines and figure what nearly two million tons of ore means in miners' wages; follow it on down, and compute the vessel tonnage required to carry it to lower lake docks; then add to the computation the employment furnished by blast furnaces, steel works, railroads, coal mines, coke works and the entire list of contributing and inter-dependent industries. Against such an aggregate, representing, say, $20,000,000 for 1,000,000 tons of miscellaneous steel exports, we are asked to weigh the supposed satisfaction home consumers of steel would get from the refusal of our steel manufacturers to sell abroad except at full domestic prices.

It appears to be a case in which an ounce of practical business sense that puts work into the mills and makes the number of employes the largest possible, is worth pounds of paper economics.

BOTH IMPORTS AND EXPORTS INCREASED.

The report of the Department of Commerce for October shows that although the increase of exports in tons is only 7,056, compared with September, the percentage of increase is 26, the total being 26,386 tons for September and 33,442 tons for October. The principal increases were: Scrap, from 202 tons in September to 1,261 tons in October; bar iron, 1,305 to 1,652; wire rods, 683 to 1,483; steel bars, 532 to 718; steel sheets, 518 to 1,050; structural material, 1,895 to 2,528; wire, 6,110 to 11,973; wire nails, 1,950 to 3,250. Recent and current export sales of pig iron, steel and finished material will greatly increase the October figures in forthcoming reports. The following table gives the exports for the articles named:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	October		10 mos. end'g Oct.	
	1902.	1903.	1902.	1903.
Pig iron	1,073	1,550	24,574	13,534
Scrap	404	1,261	8,182	4,391
Bar iron	234	1,652	18,913	16,936
Wire rods	2,999	1,483	18,245	20,526
Steel bars	598	718	8,243	14,502
Billets, ingots and blooms	125	28	2,189	1,184
Hoop, band or scroll iron	75	194	1,470	1,621
Iron rails	.....	.....	210	143
Steel rails	2,195	6,379	65,266	17,990
Iron sheets and plates	257	143	3,117	4,511
Steel sheets and plates	626	1,050	12,303	10,127
Tin plates, terne plates and taggers' tin	53	2	1,427	170
Structural material	3,813	2,528	49,783	25,093
Wire	13,071	11,973	84,076	88,205
Cut nails	580	933	6,080	7,722
Wire nails	2,947	3,250	22,345	25,609
Other nails, including tacks	156	298	1,544	1,933
Total	28,206	33,442	329,996	254,087

A rather peculiar fact is that imports for October show a slight increase as compared with September, the total increase being 5,080 tons. Imports of pig iron are 18,704 tons, as compared with 16,414 tons in September; scrap 3,836, against 1,964 in September;

bar iron 4,872, against 2,362; iron and steel rails 2,821, against 2,196; while the most notable decrease was in steel, the imports being 13,530 tons in September and 10,343 in October. The imports of iron and steel for September and for the ten months for the articles named were as follows:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	October		10 mos. end'g October.	
	1902.	1903.	1902.	1903.
Pig iron	67,204	18,704	406,610	566,090
Scrap	11,371	3,836	36,859	77,939
Bar iron	1,906	4,872	23,030	36,832
Iron and steel rails	14,365	2,821	49,388	90,094
Hoop, band or scroll	9	55	3,193	1,487
Steel ingots, slabs, billets or bars	32,036	10,343	222,011	253,553
Sheets and plates	437	264	5,163	8,160
Tin and terne plates	2,712	3,937	47,177	49,148
Wire rods	2,584	1,717	16,642	17,055
Wire and wire articles	356	405	2,802	4,153
Total	132,983	46,954	812,925	1,095,491

The imports of pig iron and steel for the first ten months of 1902 and 1903 were as follows in gross tons:

	1902		1903	
	Pig Iron.	Steel.	Pig Iron.	Steel.
January	7,833	5,312	110,679	38,691
February	8,307	2,335	45,187	20,151
March	17,184	6,570	59,628	31,464
April	19,067	13,005	99,944	29,014
May	30,708	24,388	57,139	26,389
June	32,458	35,588	79,874	30,530
July	62,156	36,124	38,046	33,070
August	79,447	39,027	40,475	20,380
September	82,196	27,726	16,414	13,530
October	67,204	32,036	18,704	10,343
	406,610	222,011	566,090	253,553

The total value of iron and steel imports for October, not including ore, but including some manufactures not named in the above table, is $2,552,380, against $4,149,631 in October, 1902. For the ten months the totals are: For 1903, $37,204,609; for 1902, $31,987,868. For the month the value of exports, not including ore, but including some manufactures not named in the table, was: 1903, $8,982,426; 1902, $8,664,734; for the ten months, $81,696,786, in 1903, and $82,016,750 in 1902.

The London *Iron and Coal Trades Review* refers to recent negotiations for a very considerable combination of British steel companies to maintain living prices and to secure greater economies in manufacture. An agreement as to prices already exists among British rail mills. But in plates and structural material, of which the average annual output in the United Kingdom in the past five years has been from 1,100,000 to 1,250,000 tons, there is no arrangement; and as production in these lines is limited to about a dozen concerns, and three of these produce nearly half the total, the difficulties in the way of a price agreement, if nothing closer, are not insurmountable. The real difficulty is the menace of American and German competition, against which loyalty to an agreement would be very hard to maintain. Our contemporary observes under this head:

> It is clear that in view of the great uncertainty that now prevails as to our future fiscal policy, it would be unwise to seek to carry out any consolidation of steel-manufacturing firms on the lines of the United States Steel Corporation. The outlook of our steel trade is likely enough to be greatly modified by the political events of the near future. If our present fiscal system is persisted in, the value of steel-making properties may conceivably fall to a very low level, in the face of unregulated foreign competition. If, however, a different system should be adopted, arrangements as to prices in our home markets may be made so much easier as to place manufacturers in a much more secure position.

PERSONAL.

It is announced that Graham Fraser, of the Nova Scotia Steel Co., will be the new manager of the Dominion Iron & Steel Co., Sydney, N. S.

Andrew Wheeler, Jr., of Philadelphia, has been made treasurer of the American Iron and Steel Association, to fill the vacancy caused by the recent death of his father.

D. F. Nisbet, until recently mechanical engineer of the National Rolling Mills of the National Tube Co., McKeesport, Pa., has opened offices at 1418 Farmers Bank Building, Pittsburg, as consulting mechanical engineer. Mr. Nisbet has had wide experience in iron and steel engineering, having been connected with the National Tube Co. at McKeesport for four years, and previous to that time with various prominent iron and steel works engineers located in Pittsburg. He was connected with the Pittsburg Iron & Steel Engineering Co., now out of existence, but one of the most prominent engineering concerns of its time.

J. Wilbert Deetrick has been appointed superintendent of the Valley mill of the Republic Iron & Steel Co., Youngstown, O., succeeding George M. Summers. He also retains the superintendency of the Hannah and Laura furnaces of the company. Henry Klein has been appointed assistant to Mr. Deetrick and will confine his supervision to the rolling mills.

Charles C. Henderson, who this week resigned as manager of the Etna plant of Spang, Chalfant & Co., Pittsburg, was presented with a diamond studded watch, charm and chain by the employes of the plant.

It is reported that the resignation of A. B. Wolvin, of Duluth, vice president and general manager of the Pittsburg Steamship Co., which operates the United States Steel Corporation's lake fleet, will shortly be tendered. The expectation is that Cleveland rather than Duluth will be the operating headquarters of the company under Mr. Wolvin's successor.

Bert Harris will retire on Jan. 1 from the firm of Sanger & Harris, scrap dealers, Cleveland, to accept the position of New York representative of the Whitman & Barnes Mfg. Co., of Chicago.

Harry Munhall, who has been superintendent of the rolling mill department of the Carnegie Steel Co., at Duquesne, Pa., for several years, has resigned, owing to ill-health. He was remembered with a gold watch and chain by the employes of his department.

H. M. Davis, until recently auditor of the Algoma Steel Co. at the Soo, takes the place of Auditor Craig, of the Lorain Steel Co., who has gone to New York as assistant controller of the United States Steel Corporation.

President Stackhouse and other officers of the Cambria Steel Co. inspected the works of the company at Johnstown, Pa., this week. Tuesday evening the party was tendered a banquet by General Manager Charles S. Price and other local officers, including about 20 superintendents of departments.

A meeting of the district managers of the Westinghouse Electric & Mfg. Co. is being held at Pittsburg this week. The meeting will close on Thursday evening with a banquet at the Duquesne Club. The district managers at the meeting are: J. R. Gordon, Atlanta; W. F. Fowler, Baltimore; R. L. Warner, Boston; C. W. Underwood, Buffalo; T. P. Gaylord, Chicago; C. B. Humphrey, Cincinnati; N. S. Braden, Cleveland; J. E. Johnson, Dallas; C. F. Medbury, Detroit; S. L. Nickelson, Department I, New York; S. J. Keese, Los Angeles; T. Julian McGill, Minneapolis; E. W. T. Gray, New York; F. B. H. Paine, New York Export; C. A. Bragg, Philadelphia; C. S. Cook, Pittsburg; G. Pantaleoni, St. Louis; W. S. Heger, San Francisco; Paul T. Brady, Syracuse; D. E. Manson, assistant manager, Boston; W. C. Webster, New York; T. F. Dryden, of the Toronto office of the Canadian Westinghouse Co.; and H. D. Scribner, of British Columbia.

Furnaces Nos. 1 and 3 of the Carnegie Steel Co., Youngstown, O., were again placed in operation this week.

Philadelphia Machinery Market.

PHILADELPHIA, Dec. 1.—If there could be room for comparison between October and November, so far as the volume of business in the machinery trade was concerned, November would perhaps make the better showing. Doctors tell us that if we are not getting better, we must be getting worse, as disease never stands still. Assuming that such is the case the situation in the machinery trade may be considered to be less favorable than last month—less favorable for the reason that most of the probabilities scheduled for November orders did not materialize, and that openings developed during November were not so promising as the propositions presenting themselves during October. There is no doubt that the trade is face to face with a condition which nobody likes to say was foreseen, and the end of which few care to comment on. That the situation will improve, very few doubt, but how soon is the question. One thing is certain—little can be looked for during December, and January is not likely to count for much. It is well known that a large amount of business is hung up to prevent its figuring in the present year's balance sheets. January will be dull because it covers a period of stock-taking, accounting and other details accompanying the review of a twelve months' run. It always has been so, and at this time becomes a matter of course.

The outlook is not so very discouraging. It is true that lately there have been some regrettable occurrences in the industrial field, but they have passed, and in themselves were not very large factors in the progress of the wheels of industry. The old cry of "Presidential election year" is made in some quarters when business prospects for 1904 are broached. Others do not anticipate any drawback on this account.

In the general summing up of the situation there are many points calculated to please the optimist. Inquiry is good, and not confined to domestic sources. Consumers' needs are marked and in many cases are not immediately supplied because they expect there will be a drop in prices. Prices are fairly firm because there is nothing like an order famine existing and producers and sellers are looking for an improved market.

Another good feature in the outlook is the betterment of the condition of the building trades. A good many of the obstacles in evidence for many months have been removed and money is coming out more freely for investment in real estate. In Philadelphia alone the building outlay for 11 months is upward of three and one-third million dollars ahead of the same records for last year. During November the estimates filed for new buildings about to be started aggregated nearly $1,500,000. Out of this the portion for new factories, workshops, and engine and boiler houses, amounted to considerably over $250,000, higher figures than for some time.

The Bement, Miles & Co. plant of the Niles-Bement-Pond Co., is fairly busy, but it is understood the work in hand is largely of a stock character. The auxiliary plant at 24th and Vine streets was recently closed down.

The Thos. H. Dallett Co., builder of electric portable drills and pneumatic tools and appliances, is quite busy. It has had a good demand for different lines, both for home and foreign consumption. Among the foreign business booked was a large order from Germany.

The Hess Machine Works booked some nice orders during the month, mostly from foreign sources. They are getting some inquiry from large plants seeking to install their own file-making machinery.

Edwin Harrington & Son Co., builder of machine tools, hoists, etc., has its new plant approaching completion. The building is under roof and it is expected that a transfer of the present equipment will commence shortly after the first of the year.

The Brown & Zortman Machinery Co., occupying exhibition space on the floor of the machinery department at the Bourse, is among those in the trade who have booked orders of some magnitude. It has taken the order for most of the equipment for the new works of the Wyand Steam Turbine Mfg. Co., Collingswood, N. J., the order covering lathes, milling machines, grinders, shapers, and drills. The new plant will manufacture the steam turbine invented by Wm. Wyand. The Brown & Zortman Co. have the agency for Flather lathes, Kempsmith millers and Baker slotters and keyseaters.

J. R. Vandyck & Co., of New York, also on the Bourse floor, report a fair business for November. The concern has just put on the market a line of open side planers embodying new features, and sales are very gratifying. They are also meeting a good demand for Higley cold saw cutting-off machines.

The Speed Control Co., lately of the Bourse, has sold the right to manufacture the Simplex variable speed countershaft made by it to the Geo. V. Cresson Co., of Philadelphia, who will in future supply the device.

The Newton Machine Tool Works report business as fairly satisfactory at their plant. During November a great many shipments were made, but they covered mainly tools of small to medium size. Among the larger shipments they mention a cold saw with 62-inch saw, for sawing nickel steel, to the Cambria Steel Co., and a large machine of special design for milling off flanged handhole openings on water tube boilers, to the Erie City Iron Works, Erie, Pa. They also shipped several special milling machines and slotting machines to Europe.

The Falkenau-Sinclair Co. had a very good month, so far as shipments are concerned. A quantity of hydraulic valves, standard punching and double crank presses were shipped, all ordinary in character. The testing machine department also made a good many shipments. This department will ship early in January the immense chain testing machine it is now constructing for the Boston Navy Yard. The company reports a good many inquiries for the automatic cement testing machine it lately brought out.

The Israel H. Johnson Jr. Co., builder of lathes, found November a good month for shipments, but the lathes sent out were all small and the destinations local. Several axle lathes went to Western parties, and some bolt lathes to Canadian points.

The St. Louis Exposition Foundry.

Further progress has been made on the plans for a foundry building, devoted exclusively to the foundry industry of this country, as a feature of the department of mines and metallurgy of the St. Louis Exposition. Director Holmes of this department was in Pittsburg last week for the purpose of enlisting the aid of the foundrymen in that district and they assured him of financial support. For the purpose of raising funds in Pittsburg and vicinity a committee consisting of I. W. Frank, George Mesta, A. W. Slocum, F. H. Zimmers and J. S. Seaman was appointed. A similar committee has been appointed in Philadelphia consisting of members of the National Founders' Association, American Foundrymen's Association and the Philadelphia Foundrymen's Association, and another committee will solicit subscriptions from foundrymen outside of these two centers. Dr. R. G. Moldenke, secretary of the American Foundrymen's Association, will supervise the erection of the foundry plant and the installation of machinery. In addition to displays of foundry supplies and equipment it is intended to install and have in operation four model foundries—gray iron, steel, malleable and brass. The building will probably be 100 feet wide and 200 feet long, and is planned to be of steel construction.

Republic Iron & Steel Co. Dividend Passed.

The directors of the Republic Iron & Steel Co. met in New York, Nov. 30, and decided to postpone the payment of the dividend on the preferred stock. John W. Gates was elected a director, succeeding August Belmont, resigned. President Thompson issued the following statement:

"In view of the present unsettled condition of the iron and steel industry, the directors deem it their duty to the stockholders to husband the company's resources and to increase its financial strength and for those conditions decided to postpone the declaration of the usual dividend. The properties of the company are free from bonded indebtedness and the quick assets of the company are largely in excess of all its liabilities. The preference shares being cumulative, all dividends in arrears will be paid as soon as a change in the conditions will permit. Since the organization of the company more than

$6,000,000 has been expended for entirely new construction, which will give the company largely increased earnings as soon as the iron industry resumes its normal conditions."

Concerning the election of Mr. Gates, a director said: "Mr. Gates holds a substantial interest in the company and it was natural that he should seek representation on the board. Mr. Gates, however, does not dominate the affairs of the company."

CAST IRON SULPHUR STANDARDS.

BY W. G. IRELAND, CHICAGO.

The determination of sulphur in cast iron and pig iron is giving the iron and steel chemists more trouble than all the other determinations they have to deal with. The method commonly used in daily practice is the evolution method, the evolving of the hydrogen sulphide into an absorbent and titrating with standard iodine solution. The iodine solution is standardized with standard borings in which the percentage of sulphur has been determined gravimetrically.

If the standard borings do not evolve the percentage of sulphur as found gravimetrically, the standardization of the iodine is incorrect. Some chemists use a steel sulphur standard and some a cast iron or pig iron standard. It is claimed that in cast and pig irons all the sulphur is not evolved as hydrogen sulphide and when samples are worked against a steel sulphur standard, results will be low.

Mr. W. E. Dickson, Sharpsville, Pa., in an article in *The Iron Trade Review* of June 18, 1903, showed the cast and pig iron standards to be unreliable after a short time, as they would not evolve the same amount of hydrogen sulphide as when first prepared and standardized. In this respect I fully agree with him.

On June 1, 1903, I prepared a cast iron standard by breaking up all coarse borings in a mortar and passed them through a 20-mesh sieve and over a 60-mesh. This gave me borings free from dust and separated graphite and of a very uniform grain. Samples were sent to several chemists whose results agreed very closely to .170 sulphur. I had a steel sulphur standard of .100 sulphur and made a great many determinations volumetrically on the cast iron standard, using the steel standard to standardize the iodine solution. All results were very close to .170 sulphur, allowing a few points for variation in work. Since that time I have used the steel standard to standardize iodine solutions, as its sulphur value of .100 was equal to the sulphur value in the cast iron .170. I have, from time to time, worked the cast iron by the evolution method against this steel standard and obtained the following results:

From June	12 to August	12,	sulphur	.170
" "	"	20,	"	.160
" "	"	26,	"	.160
" "	"	27,	"	.159
" "	"	29,	"	.157
" "	September	24,	"	.152
" "	October	14,	"	.150
" "	November	17,	"	.147

It will be seen that there was a gradual decrease after two months in the sulphur obtained volumetrically which if used as a standard of .170 would give a high iodine factor and high results. I then tried annealing the borings by heating them to a dull red in a covered porcelain crucible for 15 minutes with the following results:

	Evolution Method.		Oxidation Method.
	Sample not annealed.	Sample annealed.	Not annealed.
Oct. 16, 1903....	.150	.169—.171	
Nov. 17, 1903....	.147	.171	.172

This plainly shows that while my cast iron standard was useless before annealing, after annealing it was all right, as I obtained results volumetrically which compared with gravimetric determinations.

The American Foundrymen's Association send out standards showing percent of sulphur by the evolution method and percent of sulphur by the oxidation method. Their standard "B" shows .038 sulphur by the evolution method and .056 sulphur by the oxidation method. I obtained some of this standard, also some sulphur standard prepared and used by a Chicago chemist, which I will mark "X." Results in those two standards volumetrically were as follows:

	American Foundrymen's Ass'n Standard "B."	Standard "X."
Official analysis reported..	.036 sulphur evolution .056 " oxidation	.136 sulphur oxidation
Without annealing..	.038 .036	.130 .130
Annealing 15 minutes.....	.057 .059	.134 .135

Duplicate results were by two chemists.

This I think proves that cast iron standards are not to be relied on unless annealed before using and that there is not a "loss of sulphur in borings of pig or cast iron" as stated by Mr. W. E. Dickson, but that it is changed to some organic compound which is either not absorbed by the alkali solution or does not react with the iodine in the titration. This condition is overcome by annealing the borings before using, as you will then get results by the evolution method which compare very closely with results by the oxidation method.

All volumetric results given were worked against a steel standard, which I standardized volumetrically against a cast iron standard, immediately after cast iron borings were taken from the standard bar, prepared and standardized gravimetrically.

Results from a steel standard prepared in this way are equal to results when using a cast iron standard, and I think preferable, as steel will always evolve the same sulphur value, while cast iron will slowly change, as I have tried to show.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

(Special Telegram.)

NEW YORK, Dec. 2.—About 600 members and guests are registered at the annual meeting of the American Society of Mechanical Engineers which opened last evening. President Dodge gave his address last night [it appears elsewhere in this issue] and later explained that the data were the averages taken from 70 to 80 instances in each of the classes of employes cited. Today's is mainly a business session and the morning proceedings included a report of the satisfactory progress of the Carnegie gift for an engineering house. The election of officers was announced by the committee to canvass the vote. The officers elect are as heretofore given in these columns. The president-elect Ambrose Swasey acknowledged the honor and spoke reminiscently of the society's earliest history.

The report of the committee on specifications for steel castings and boiler plate was referred to the joint committee on testing materials, after an earnest discussion on yield point, standard test pieces, etc.

A committee will be appointed to prepare memorial data for the 25th anniversary of the society two years hence. The now constitution and by-laws were adopted. F. B. Richards' paper entitled, "Is Anything the Matter with Piece Work" was discussed spiritedly. Other papers scheduled for today were crowded over and will be submitted at the Stevens Institute on Thursday.

G. A. Tomlinson, of Duluth, has contracted with the American Shipbuilding Co. for the building of a steel freighter 494 feet over all, which will carry 10,000 tons of ore. It will cost $350,000.

The Cleveland Steel Co., Cleveland, reports that it has found business during the past month greatly improved over the last several months preceding. It finds a good demand for light plates, considering the season of the year. Collections are also comparatively easy. The prospects for future business appear to the company better than they have for some time, and it expects to do a normal volume of business during the next few months.

The recent dissolution of the Claire Furnace Co., Ltd., of Sharpsville, Pa., was merely the winding up of the affairs of the old company, which was succeeded several years ago by the Claire Furnace Co.

NEW BOOKS.

"The Mineral Industry; Its Statistics, Technology and Trade." 1903. Published by the *Engineering and Mining Journal*, New York. Price, $5. Like its predecessors, this volume is a bulky octavo and covers a wide range of data concerning the production of the minerals and metals that have contributed to the industrial importance of the United States. The preparation of a volume of 890 pages, presenting in such detail a year's history of the mineral industry, and giving statistical data in advance of publication through official sources, of necessity involves some estimates. But even here there is a close approximation to the actual, and the wonder is that so great a body of valuable information can be prepared and revised within the time allotted to the work. The valuation put upon the total mineral and metal output of the United States, from both domestic and foreign ores and bullion, in 1902 is $1,431,072,789, as compared with $1,367,983,548 in 1901—a gain of $63,089,241. The greater part of the statistics of the domestic production of the United States in 1901 and 1902 is obtained from the Department of Mineral Resources of the United States Geological Survey. The work of a number of new contributors, who write authoritatively, appears in the volume. These include "Notes on Progress in Iron and Steel Metallurgy in 1902," by Frederick Hobart; "Progress in the Corundum and Emery Industry During 1902," by Joseph Hyde Pratt; "Progress in the Aluminum Industry in 1902," by John B. C. Kershaw; "By-Product Coke Ovens," by F. Schniewind; "Progress in the Metallurgy of Nickel During 1902," by Titus Ulke; "Progress of Metallography in 1902," by William Campbell.

"The Mechanical Engineer's Pocket Book" (for 1904), edited by William H. Fowler, is a 4 x 6-inch volume of some 450 pages bound in red leatherette. There is a copious index and the work of revision and addition is very evident in comparison with the preceding issues of the present and earlier years. The section on gas engines has been largely rewritten. The work is published by the Scientific Publishing Co., of Manchester, England, at 1s 9d, a very moderate price indeed for the amount of information.

"Friction and Lubrication," by William M. Davis, is a handbook on a subject of much importance. The author has presumably had more than the average amount of experience with the composition and use of lubricants and his discussion is invariably of a very practical character. The theoretical treatment of friction is not so happy in manner as other portions of the work but the points of most value are well and concisely handled and the book as a whole is a distinct addition to the literature of lubrication. The treatise is cloth bound, has 225 6 x 8-inch pages, 60 illustrations, a good index and is published by the Lubrication Publishing Co., of Pittsburg. Price, $2.

"Compressed Air," by W. C. Popplewell, is an attempt with considerable success to bring the descriptive material of pneumatic equipment to date by collecting the scattered data from technical journals and other sources. The author has numerous examples of air transmission mechanism and has given at least a fair share of the available space to American productions. There are chapters on the history of the industry, compressed air calculations, efficiency tests, pneumatic pumping appliances, etc. The book is cloth bound, 284 6 x 9-inch pages, and over a hundred illustrations. The Scientific Publishing Co., of Manchester, England. Price, 7s. 6d.

"The Gas Engine," by F. R. Hutton, is an important contribution to the subject of which it treats. The majority of leading authorities have been mainly concerned with the development of the gas engine abroad, but the present treatise selects for illustration and criticism the typical and suggestive forms of modern American consideration. The chapters on the carburetor, ignition, governing, testing, etc., are thorough and will be of much assistance to builders or engine users in practical touch with these questions. There is an exhaustive analysis of the behavior of the liberated heat and some attention is paid to the problem of heating air at constant pressure with a view to the employment of the gas turbine as a motor. There are 483 6 x 9-inch pages, 243 illustrations. Cloth bound, $5. Publishers, John Wiley & Sons, New York.

"The Elasticity and Resistance of the Materials of Engineering," by Wm. H. Burr, is practically a new book. More than half the contents is new matter and the general arrangement has been considerably changed in the hope of rendering the data better adapted to the needs of student and practicing engineer. The first 200 pages discuss the theory of stresses in structural members as regards simple forms and general cases. The physical properties of nickel and manganese steels, aluminum, copper, tin, zinc and alloys are fully presented. Concrete receives much attention and the armored combination is freely illustrated with examples from actual design. The tabular matter is of great variety and extent and submits the results under actual test of all classes of engineering materials, inclusive of full sized steel eye bars, beams and columns, riveted joints, alloys in tension, compression and bending, steel and hemp cables, etc. The sixth edition is cloth bound, has 1,100 6 x 9-inch pages, with many excellent illustrations. Published by John Wiley & Sons, New York. Price, $7.50.

"Graphic Statics," by Jerome Sondericker, is said to be the outgrowth of an extended experience in teaching at the Institute of Technology, Boston. The book deals with the problems encountered in building construction but will be found of service to students of engineering generally. There are 137 6 x 9-inch pages, three folding plates and some 70 illustrations. Cloth bound, $2. Published by John Wiley & Sons, New York.

Colorado Fuel & Iron Co.'s Affairs.

Rumors of a receivership for the Colorado Fuel & Iron Co. were in circulation in New York last week. E. Parmalee Prentice, son-in-law of John D. Rockefeller and vice president of the company, asked about the receivership rumor, said: "Nothing like that is contemplated. That is one thing we want to avoid. There is as much chance of it as of my going into bankruptcy. We have raised, we think, sufficient money by the sale of coal and iron properties last summer and lately to take care of the indebtedness of the company. That is why a special meeting of the stockholders has been called for Dec. 15 at Denver. The stockholders in general will have an opportunity to come in on the transaction on equal terms—those who want to. Through the raising of this money we think we will be able to operate the company successfully."

Asked what were the coal and iron properties that had been sold, Mr. Prentice did not reply specifically. He said that the transaction had been arranged partly last summer and partly just now. Mr. Prentice also stated that both in the company's charter and in the agreement under which the convertible bonds are issued it is provided that in order to issue other bonds the consent must be had of every single one of the holders of the convertible bonds. He added that it was possible, by vote of the stockholders, to change the charter, but the agreement under which the convertible bonds are issued could not be changed unless every holder gave his consent. Mr. Prentice said positively that there was no idea of an endeavor to issue new bonds.

The wire mill of the company was closed Nov. 29 and all producing departments have now ceased operation. It is understood that the company will take advantage of conditions incident to the coal strike to make repairs in the entire plant. With all departments shut down only a few hundred men will be employed where a short time ago 6,000 men drew wages. Some of them have gone to work in place of strikers in the coal mines.

The 28-inch mill of the Homestead plant of the Carnegie Steel Co., Homestead, Pa., was again placed in operation this week after a long idleness, during which extensive repairs were made. Work on the erection of the new 140-inch plate mill is progressing rapidly.

The Eastern Machinery Market.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., NEW YORK, Dec. 1.

That things are shaping themselves for the better in the machinery trade, is the conclusion many machinery merchants draw from developments during November. Previous to the past month, considerable hopefulness prevailed in machinery circles, but there was very little to justify it. But in the past few weeks, so many good contracts have been closed, and inquiries have been so numerous in many lines, that statements that trade has improved, and predictions that it looks as if it would continue to improve, can be backed up quite substantially.

In machine tools, there were several developments that gave satisfaction. The foremost of these was the action of the National Machine Tool Builders' Association, in deciding to maintain present prices. This imparted strength to the market, and was followed by orders which had been held up in the belief that lower prices would prevail. These were made up of small lots, yet in the aggregate they made a gratifying exhibit. There are many evidences of a determination by manufacturers to refuse to make concessions, the opinion being that the depression will gradually give way to a better feeling.

Another thing that is pleasing to machine tool men is the fact that some railroad propositions which have been held up for some time, will soon be released. One of these is for the equipment for the new shops of the Lehigh Valley railroad, at East Sayre, Pa. During the past week the company placed orders for the engines, and machine tool merchants regard this as an indication that the company will soon be heard from in connection with the machine tool equipment. There has been a report concerning plans of the New York Central railroad for adding tools to its West Albany shop equipment, but this cannot be verified.

Regarding machine tools for industrial plants, the month brought the news that the International Steam Pump Co. is at last seriously considering the purchase of the equipment for the new Worthington plant at Harrison, N. J. The company is now disposing of an issue of $2,500,000 debenture bonds, the greater portion of which will be devoted to completing the plant, including the equipment. While this means the purchase of several hundred thousand dollars' worth of machine tools, little interest is manifested by the trade, in view of the general belief that the Niles-Bement-Pond Co. will secure the greater part, if not all, of the contract. It is said that the Niles company has already practically closed the contract for the cranes.

It is reported from Schenectady that the General Electric Co. will soon issue specifications for the machine tool equipment for its new turbine shops in that city. We are informed that the company's purchases are likely to be on an extensive scale, and that it would have been in the market long ago but for the belief that lower prices could be had by waiting.

In engines and boilers, particularly the former, November showed improvement over the previous month. Many large contracts held up for some time were closed. The most notable of these was the equipment for the new shops of the Lehigh Valley railroad, at East Sayre. The order went to McIntosh, Seymour & Co., of Auburn, N. Y. It consisted of three 1200-h. p., one 600-h. p., and two 225-h. p. engines. The competition for this business was the keenest seen in some time, for it formed one of the best propositions in the engine line that have appeared this year. Another large engine order, recently closed after being held up for some time, was for two 900-h. p. engines for the shops of the New York Central railroad, at West Albany, N. Y. This went to the Ball & Wood Co., of 17 Battery Place, this city. Another large engine contract closed during the month, was for a 450-h. p., for E. Faber, Brooklyn, N. Y. It was taken by the Shepherd Engineering Co., of Franklin, Pa.

Engine men were particularly pleased with the fact that they were called upon to bid on more work in November than in any one of the preceding six months. They attribute this to easier conditions in the money market, and are confident that when there is no apprehension on that score they will be able to book considerable business. For small horsepower engines the demand grows better, manufacturing establishments especially looming up as prospective buyers. In boilers, an awakening in demand has appeared also. The majority of orders and inquiries are for small units.

Electrical machinery manufacturers say their line has been more active during the past few weeks. In heavy equipments, the orders placed by the New York Central, and New York, New Haven & Hartford railroads, with the General Electric Co., have had a good effect. Less complaint is heard nowadays about the demand for small equipment. In the building industry there are many large contracts lying dormant, because of the inability to finance schemes in which they figure. Orders for motor driven tools were more plentiful during November than in the month previous. In machinists' supplies, the retail trade has considerably improved.

The foreign machinery trade during the month showed improvement. American interests are giving this field very close attention and expect to close some good contracts early in the new year.

The Niles-Bement-Pond Co. found November somewhat better than October. Most of its orders were of moderate size. It closed a good contract in England for punches and shears. This firm regards the railroad machine tool outlook as very bright, and expects the early months of the new year to bring about considerable improvement in business.

The Prentiss Tool & Supply Co. did a very satisfactory trade during November. It finds inquiries are coming in more freely, especially from manufacturing centers, and takes this to mean that general business conditions are getting better. Collections are slow, and many are seeking to buy on 60 and 90-day payments.

W. B. Mayo, representative of the Hooven, Owens & Rentschler Co., at 39 Cortlandt street, closed a large number of contracts for small horsepower engines during November, and bid on more work during November than in any month this year.

The American Wood Working Machinery Co. has found business fair recently. It believes that when money conditions get better, it is certain to close many good contracts, especially among railroads.

The Crocker-Wheeler Co. found November an exceptionally good month. Orders showed a decided improvement over October, with the outlook very bright for the near future.

Thayer & Co., Inc., say that in steam boilers, several large propositions are about to be placed. Their current business is excellent, although it is mostly for small units.

The Ingersoll-Sergeant Drill Co. says it booked more orders for its specialties during November than in October. The company reports foreign trade to be particularly good.

After an idleness of several weeks the Oley street and Ninth street mills of the Reading Iron Co., Reading, Pa., resumed Nov. 30, giving employment to 500 hands. The Carpenter Steel Works, at Reading, with the exception of the crucible department, also started up Nov. 30. It is believed this company will continue in steady operation, notwithstanding that it has gone into the hands of a receiver. Seyfert's rolling mill, near Reading, resumed Dec. 1 after a long idleness.

Standard Mining Co. has turned over to D. M. Philbin and associates its option for a lease on the Arcturus mine in 56-24, west Mesabi, and Mr. Philbin will now try to handle it. He is manager of the ore end of the Great Northern road, and the Arcturus is really a proposition in which the freight item predominates.

The Labor Situation.

PROPOSED WAGE REDUCTION IN SHEET MILLS.

A meeting of the Independent Sheet Manufacturers' Association was held at Pittsburg on Tuesday, Dec. 1. It was announced at the meeting that the Amalgamated Association of Iron, Steel and Tin Workers had called a special convention of sheet workers to be held at Pittsburg on Tuesday, Dec. 8, for the purpose of considering the removal of the limit of output in all the sheet mills having lodges of the Amalgamated Association. This will affect the union mills of the independents and the American Sheet Steel Co. alike. At the special convention of sheet workers, held in Pittsburg several months ago, the vote on removing the limit of output was overwhelming against the proposition, but since that time the association has lost one mill entirely, the Stark Rolling Mill Co., of Canton, O., and other independents will be unable to operate their plants in competition with the American Sheet Steel Co. unless the limit is removed. As the sheet workers favor a convention, it is certain that the limit will be entirely removed, thus placing the independent sheet mills on the same footing exactly as the non-union mills of the American Sheet Steel Co.

At Tuesday's meeting another proposition came up for consideration with which the independent sheet mills have had to contend since the limit of output removal became an issue. Several weeks ago the American Sheet Steel Co. reduced the wages of all its sheet workers in its non-union mills about 20 percent, but of course no reduction was made in the union mills where the Amalgamated scale is in force. By this reduction in wages the American Sheet Steel Co. can produce sheets much cheaper at its non-union plants than can be done at the Amalgamated mills and it was decided to ask the Amalgamated Association to make a similar allowance in its sheet workers' scale. Even with the removal of the output limit the independents will be in no position to compete with the American Sheet Steel Co. mills where the 20 percent reduction has gone into effect, and unless this reduction is granted in wages the independent mills will be forced to shut down. At the special convention to be held next Tuesday, it is doubtful if the question of a reduction in wages can be considered, as the convention has been called for only one purpose, the removal of the limit of output, and no other matters can be considered. This will necessitate the calling of another convention, and as the Amalgamated Association is violently opposed to allowing any reductions in its scales during the scale year, the calling of a special convention for this purpose will meet with much opposition.

STRIKES CAUSE IDLE PLANTS.

Percival Roberts Jr., the well known retired steel manufacturer, was interviewed a few days ago in regard to the rumor that the Pencoyd Iron Works might be removed to Pittsburg. He said:

"I have heard nothing that would lead me to suppose the Pencoyd Iron Works will close down permanently. The lack of business which has led to the laying off of so many men is fundamentally due, I think, to the labor troubles that have raged throughout the country, and which have made people fearful of extensive building operations. This has caused a great cut in the demand for the products of the Pencoyd works, resulting naturally in dull times and a laying off of men. After a while, when in the course of these labor disputes enough men have gone hungry long enough, and the difficulties are adjusted, there will be a renewal of building operations. This will cause a demand for Pencoyd products again, and I expect to see the plant running on its former large scale. I see no reason why this should not be so, for certainly the business at Pencoyd has been and should continue to be a profitable one."

STRIKE OF THE STRUCTURAL WORKERS IN NEW YORK.

The strike of the structural iron workers in New York City continues. The union claims that 2,000 men are out, including employes in Indianapolis, Pittsburg, Washington, Newark, Boston and Kansas City, and that their action put 10,000 other workers out of employment. The employers declare that the strike has proved a fizzle. "In Pittsburg and New York," Secretary Cheney of the Iron League states, "the men voted unanimously not to order a strike. In Chicago they are still working. All told not more than 500 men went on a strike outside of New York." The structural work on six large buildings in Boston has been stopped. The Journeymen Stonecutters' Union, New York, the mainstay of the iron workers in its struggle, has called off its strikes against members of the new union of housesmiths. This is declared to be the worst setback Parks' union has yet received. The George A. Fuller Construction Co. has had considerable trouble with its contracts, but President McConnell states that it is gradually getting all the men it needs from the new union, just organized, which is recognized by the Iron League. The iron chippers, who put the finishing touches on the structural material before it goes into the buildings, report that many of their men are out of work on account of the strike of the Parks union.

LABOR NOTES.

On account of the discharge of two men, 150 employes of the Baltimore Iron Works, Canton, Md., have gone on a strike. The company had in view a reduction of wages and the men were apparently satisfied to accept the readjustment, but it was learned that two of the employes were engaged in an effort to stir up strife, and their actions were such as, in the opinion of the company, to warrant their dismissal. A strike resulted.

The Aetna Nut Co., Southington, Conn., has reduced the wages of its employes 5 percent, effective Dec. 1. About 150 men are affected.

The strike of the union molders at the plant of the Indianapolis Foundry Co., Indianapolis, Ind., is suggestive of a military post. Armed guards patrol the grounds. The strikers have established outposts and the sentinels are relieved with military precision every two hours.

Employes of the galvanizing department of the Wheeling Car Works, Wheeling, W. Va., have been notified of a reduction of 20 percent in wages, effective Dec. 1. Employes of the tin house, whose wage agreement does not expire until July 15, declined to accept the cut, and it was not pressed.

Employes of the Sharon works of the American Steel Foundries have been notified of a reduction of about 10 percent in their wages, effective Dec. 1. About 700 men are affected.

The plant of the Central Foundry Co. at Vincennes, Ind., has closed its doors as a result of recent labor troubles.

Molders in the employ of the Moline Plow Co., Moline, Ill., have decided not to accept the proposition made by Superintendent Stephens, for resuming operations in the foundry. The offer was that the molders individually sign contracts of from one to ten years, as they pleased, the terms to be that the men should return to work at the scale of wages prevailing at the present time. The company would agree to provide other men to cut the sand in the morning, relieving the molders of this work, and giving them the time consumed in this work for straight molding, enabling them to make from 50 to 75 cents a day additional in wages. The molders' proposition was the recognition of the union and the making of a contract with it.

Trouble which had been brewing since the molders went on a strike last May at Moline, Ill., culminated last week in a shooting affray, in which union and non-union molders and the police were mixed up. One union molder was shot and may not recover.

Notices have been posted in all of the mines of the Empire Steel & Iron Co., in Mount Hope, Hibernia, and other mines in Morris county, New York, to the effect that a 10 percent reduction would be made in the wages of miners. The order is effective Dec. 1, and affects 3,000 men.

The strike among the machinists' helpers at Smithville, Texas, has been declared off, and nearly all of the men have returned to work, going back at the old scale of wages.

About 1,500 employes of the Irondale plant of the Deering Co., a subsidiary concern of the International Harvester Co., were notified Nov. 29 that their services would no longer be

needed. It is understood that about 6,000 employes of the International Harvester Co. at different plants will be laid off.

A general order issued by the Cambria Steel Co., Johnstown, Pa., which took effect Nov. 30, placed the single turn employes on a nine-hour basis. The order affects 13,000 men. It is the plan of the company to curtail the working hours of employes rather than to discharge them.

Employes of the Burden Iron Co., Troy, N. Y., have formed a union in accordance with a request from the company which found difficulty in selling its rivets in New York on account of the opposition of structural ironworkers.

A readjustment of wages will be made by the Parkersburg Iron & Steel Co., at its plant at Beechwood, W. Va., about Jan. 1. The new scale will be made so as to conform with those of similar companies in other cities.

Employes of the Diamond State Steel Co., Wilmington, Del., who are dissatisfied with the proposed reduction of 50 cents a ton for puddling, have presented their complaint to the manager. The men state that they would not object to a cut of 25 cents. The matter will be submitted to the national union.

The officials of the Inland Steel Co., Indiana Harbor, Ind., have decided to close the entire plant indefinitely because no settlement can be reached with the steel workers, who refuse to submit to a reduction in wages. About 1,500 men are thrown out of employment.

The Northern Pacific Railway has cut the schedule in its shops in several cities, so that each man loses practically one day's earnings a week. The Great Northern has taken similar action.

In the Pennsylvania railroad shops at Harrisburg, Pa., 240 men have suffered a reduction of 10 percent in their wages.

A notice has been posted at Lock Ridge furnace, Alburtis, Pa., that another reduction of 10 percent will be made in wages beginning Dec. 13.

The union men employed in the Passaic Steel Co.'s plant, Paterson, N. J., have voted not to go on a strike, and will submit to the reduction in wages proposed by the company. About 900 men are affected. It was the general expectation that a strike would be ordered, but it was prevented owing to the influence of Foreman John K. Cooke.

At the first meeting of the executive board of the Citizens' Industrial Association of America, being held at Dayton, O., this week, one of the measures which may come up is a recommendation that members when purchasing goods give preference to such articles as do not bear marks or labels discriminating against any class of workers. The advisability of establishing a bulletin or official organ will also be passed upon. The policy of the association will be more definitely outlined and steps will be taken to spread the doctrine of organization among employers through the United States.

The Born Steel Range Co., Cleveland, has decided to divide the work at its plant between the men who were recently laid off and those who are still working, giving all a part of a week's employment.

The employes of the Stark Rolling Mill, Canton, O., have received notice of a 20 percent reduction of wages, to take effect within a short time.

Six hundred employes of the Sharon works of the American Steel Foundries received a reduction of 10 percent in their wages Dec. 1. The men decided to accept the cut.

President Buchanan, of the bridge and structural iron workers, is in Chicago endeavoring to arrange with representatives of the union in 25 cities a national wage scale. He was unable to bring about an agreement, and disruption of the national organization is threatened. After hours of wrangling a subcommittee of seven was appointed to investigate the matter.

The first clash between trades unions and the new Fox River Valley Manufacturers' Association, which stands for a 10-hour day in the Fox River manufacturing district, came when employes of the United States Wind Engine & Pump Co. at Batavia, Ill., struck, because they were refused extra pay for working over nine hours. Fifty members of the machinists' and wood workers' unions struck Nov. 30 and have not returned to work.

Retrenchments by the International Harvester Co. in laying off nearly 3,000 men have been attended by riots similar to those which marked the discharge of several thousand workmen at the Illinois Steel Co. plant at South Chicago. Four hundred men engaged in a free-for-all fight at the McCormick works Nov. 30, when 250 employes in the foundry department were paid off and told that there would be no more work for them before the first of the year at least. These men insisted that others who had been retained should go out with them. The blacksmiths' union claims that there has been discrimination against union men in discharging employes of the Deering division, and General Manager Clarke has assured the Chicago Federation of Labor that the matter will be investigated.

It is understood that the American Steel & Wire Co. has arranged with its employes at its mills at Newburg and the HP Nail Works, Cleveland, for a reduction in wages, averaging about 10 percent, the cuts being largest on those who receive the highest wages.

LAKE SUPERIOR IRON MINES.

Apropos of recent newspaper reports, on their face apocryphal, of large ore finds in the Canadian Lake Superior region, it may be said that the Canadian Northern road has stopped all exploration it had been conducting for a year and more on the Atikokan range, north from Minnesota. It is understood that, while ore was found, it was not of a character to warrant further exploration. There is now very little work going on in Western Ontario. All that had been done around the Nipigon has been stopped. Near Steep Rock lake the drills are off. The United States Steel Corporation is through west of Lake Superior. Of course the Consolidated Lake Superior Co. is doing nothing, either on the Michipicoten range or elsewhere. M. A. Hanna and Pickands, Mather & Co., who had been working until quite recently on Hunter's Island and west of Port Arthur, have pulled out. Duluth parties, who spent a large sum near Atikokan, are through for the present. The Atikokan Iron Co., a Duluth concern, is idle. In fact the entire Ontario region north and west of Lake Superior is abandoned, temporarily at least, by iron ore people.

The Minnesota Iron Co. is carrying on some exploration in Minnesota still, though most of its work is abandoned. One point at which satisfactory work is under way is on the east ½ of the sw ¼ of section 6 T 57 R 17, half a mile west of the new Fayal stripping on land owned by Murphy & Dorr. Testpitting crews and a diamond drill are at work there. This tract has been unsuccessfully explored before.

The Consumers' Ore Co. (M. A. Hanna & Co.), which is opening a mine on section 21 T 58 R 19, is now down 250 feet with the main shaft in ore and will rest at 270 feet, where the first level will be opened. This mine will be a considerable producer the coming year. It is a State lease, paying 25 cents a ton to the public school fund. The same company owns another State lease, the s ½ of section 11, same township, and is clearing the ground and preparing to open a mine there also. This is a small ore body. This is to be called the Yates mine, and that on 21 is the Frantz. The company has two other State leases that contain ore and that will be opened later.

Drills have been taken in north from Virginia to a point in T 62 R 19, 24 miles north of the Mesabi range, where there are claimed to be excellent indications of iron. Work will be carried on all winter. Ore has been known to exist thereabouts for many years, but of its value there is much doubt. For the past two or three years some work has been carried on, chiefly by the Great Northern road, but it is not supposed that results have been satisfactory.

The Pitt Iron Mining Co., a subsidiary concern of the LaBelle Iron Works, Steubenville, O., owns two Mesabi range mines, Miller and Pitt. The former is a 35-cent lease and has been opened this year. It has now closed and the pumps are to be pulled for the winter. Pitt, which has been idle since August, was opened Dec. 1, and will be active all winter with a force of about 75 men. It is a small property but mines an excellent ore.

Stripping continues at a number of mines of the Mesabi,

but the weather is cold and frost is going down fast, so any day is liable to stop work for the season. Mines on which stripping has been in progress to Dec. 1 include Morris, Monroe, Stephens, Burt, Fayal, of the Minnesota Iron Co. (U. S. Steel); Biwabik, Cyprus, Stevenson, Holland. At this latter mine, by the way, the stripping is by hand and it is said that a cost of about 30 cents a yard has been reached. Holland expects to strip all winter, the idea being that if the work is done by hand frost will get into the ground less than if by shovel, for by the latter method a high face is left exposed for some time, while the shovel is moving ahead.

Economy in mining operations on the old ranges is manifesting itself in the return of the 10-hour day system. The Cambria and Lily mines of the Republic Steel Co. at Negaunee, Marquette range, have returned to the 10-hour basis. The Ishpeming Mining Co., operating the East New York mine, has also lengthened its shifts to 10 hours.

The Illinois iron mine, the only one in operation near North Freedom, Wis., was shut down Nov. 25. The pumps have been removed and water allowed to fill the mine.

Mining work is still suspended at the Penn Mining Co.'s West Vulcan mine at Norway, in the fifteenth level, at which an unexpected flow of water was tapped, driving out the men.

At Ishpeming, Mich., 350 employes of the Cleveland Cliffs Iron Co., were laid off on Nov. 30 because of the slackened demand for iron ore.

Mines operated by Pickands, Mather & Co. in Minnesota have shipped as follows this year: Corsica 34,034 tons, Elba 93,630, Minorca 115,000, Sparta 40,373, Malta 11,675, Troy 15,000, Albany 120,000 Utica 155,000. On the Gogebic, Cary 86,723, Mikado 112,000. On the Menominee, Baltic 128,470, Vivian 11,878, Verona 49,735, Hemlock 79,179; total all ranges, 1,052,707.

Most of the Mesabi mines operated by companies of which Capt. Joseph Sellwood is manager have closed for the season, with productions generally speaking a little above their minimums. Leetonia, in section 11-57-21, is closed with a total of 200,000 tons. It is a steam shovel mine, and Butler Bros., contractors, have a long time contract for the removal of 1,000,000 yards of stripping and the mining of 3,000,000 tons of ore. Their stripping is to be done in the next four years. Cypress, adjoining Leetonia, is closed with a production of 125,000 tons for the summer. It is also a stripping mine. Pearce and Morrow, in sections 28 and 29 58-20, have closed with about 50,000 tons each. Longyear, in section 5-57-20, is closed with 85,000 tons, and still has a stockpile of 25,000 tons on hand. Croxton section 13 58-20, has shipped 101,800 tons. It is a milling mine. Cass, in section 2, 58-16, has shipped 60,000 tons and is closed. Kanawha has shipped 35,000 tons and is permanently closed. Larue has shipped 35,000 tons and will produce about 10,000 tons more before the season closes. This mine was not connected with rail facilities until August. It is an open pit property in section 29 57-22. In most of these mines, Drake, Bartow & Co., of Cleveland, are interested with Mr. Sellwood; in Cypress, Pickands, Mather & Co. are half owners. Cass, Cypress and Larue are mines opened this year for the first time; all the others but Kanawha were small initial shippers in 1902.

The two mines of the International Harvester Co., on the Mesabi range, of which Joseph Sellwood is manager, have closed shipments with about 110,000 tons each. Hawkins is a milling property, but will probably be made over into an open pit steam shovel mine bye-and-bye. Agnew is to be transformed at once from an underground mine, operated by the caving system, to an open pit mine. The company has commenced the removal of 1,650,000 yards of earth and 300,000 yards of taconite, in order to uncover more than 5,300,000 tons of ore, running about 60 percent. The surface averages 63 feet and the ore is 121 feet thick. This will be called one of the deep surfaces on the Mesabi, but it is far less than what will be stripped in a short time, if all signs do not fail.

The Daniels-Spellman property in lot 4, section 5, and lots 1 and 12, section 6 58-15, is now under lease to Messrs. Moore, Coates et al., of Virginia. The option was originally to the Century Commercial Co., of Duluth, on a 20-cent basis and a 50,000-ton minimum. The fee owners have reduced their minimum to 25,000 tons for each of three years, and have received $15,000 advanced as royalties, while the Century Co. gets 5 cents additional royalty as the ore is mined. The present lessees except to turn over their lease to some operating company for a bonus, but have done nothing so far. There are some 800,000 tons of excellent hard ore in the property.

A State lease in 14-57-22 has been taken by the Eddy Bros., of Bay City, former owners of Penobscot mine, and they will have two drills there in a short time. The Eddys have been exploring on their own lands, a short distance north of this property, for some time.

The big mines of the United States Steel Corporation on Lake Superior, that is those with products of 400,000 tons or more, have been as follows this year, according to figures from the offices of the Oliver and Minnesota companies at Duluth: Fayal, Minnesota, 1,460,815 tons; Mountain, Minnesota, 1,342,697; Adams and Spruce, Minnesota, 1,109,797 and 585,815; Burt, Minnesota, 631,147; Hull, Minnesota, 438,302; Chandler, Minnesota, 460,548; Pioneer, Minnesota, 596,780; Norrie, Michigan, 700,981; Chapin, Michigan, 704,114; Aragon, Michigan, 522,035; Lake Superior, Michigan, 620,000. These twelve mines have produced this year 9,141,303 tons of ore. All but the Mountain and Burt are wholly or in larger part underground.

The Oliver Iron Mining Co. has decided that the showing made at the Gibson mine, Marquette range, does not warrant continuance of exploratory work. The pumps have been pulled out of the mine and the company has ended its connection with the property. Mr. Gibson will attempt to get others interested.

Alabama Steel & Wire Co.

The new blast furnace of the Alabama Steel & Wire Co., at Gadsden, Ala., will be blown in as soon as the electrical equipment, which is now being tested, is in approved condition. The same power house will also furnish current for the Gadsden Street Railway, which is owned by the company. Water for the blast furnace plant is brought 1¼ miles, being pumped through a 20-inch main by two Worthington turbine pumps with a capacity of 12,000,000 gallons in 24 hours. These pumps are connected direct to motors furnished by the Elwell-Parker Electric Co., of Cleveland. The two generators were furnished by the Westinghouse Electric & Mfg. Co. and are 300-k. w. three-phase machines from which are taken at the same time voltages of 500 and 250.

The ore property which the Alabama Steel & Wire Co. owns yields ore running 57.5 percent in metallic iron which is unusually high for Southern ores. The entire field in which the vein lies is controlled by the company, and the outcrop is followed for twelve miles. The company's coal supply is of excellent quality also. Coke made from its unwashed coal has shown on analysis less than .05 percent sulphur.

The general offices of the company are now at Gadsden. Its Ensley plant will be moved to that point as soon as possible.

President Eaton, of the American Car & Foundry Co., has issued a statement in which he says: "Business conditions have materially improved the last two months. While current orders for cars are small as compared with a year ago, they show an improvement as compared with two months ago. We have only closed one of our plants so far, and that is a small one at Terre Haute, Ind. The finances of the company are in good condition, our working capital being now approximately $15,000,000."

The Aultman-Miller plant at Akron, O., was to have opened Nov. 30 for the first time since the failure of the Aultman-Miller Co. last spring, but it was deferred one week because of the non-arrival of material. The plant was purchased by G. W. Allen and Judge W. A. Vincent, of Chicago, and a company was organized. It has been manufacturing binder twine for two months, and expects to manufacture reapers on a large scale.

TRUING UP DRAWING INSTRUMENTS.

BY FRANK B. KLEINHANS.

A true instrument is a rare thing in a drawing room. If one would take the time to notice the condition of the drawing instrument in our best equipped, modern drawing rooms, they would be surprised at the crudeness of the instruments with which modern engineering is done. The first thing which would possibly be found greatly in error would be the triangles. Usually, the operation of truing up a triangle is such as to be beyond the reach of the ordinary draftsman and therefore the triangle or tee square is used from day to day, until one forgets that it is really important to have them trued up.

To begin, take a board about 8 by 10 inches by ¼-inch thick and run it across a jointer to bring the faces true.

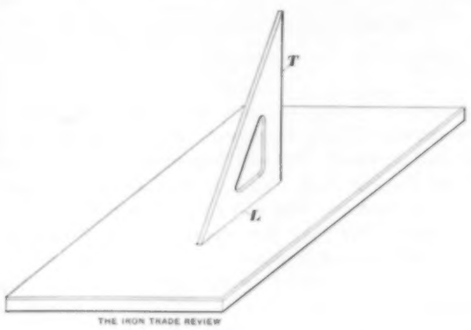


FIG. 1.

After the board has been planed off smooth, glue on a piece of No. 0 sand paper, and put it into a letter press to dry, usually the pattern maker will do all this for you. When the glue is perfectly dry trim the edges of the sand paper as shown in Fig. 1. You should now have a perfectly true sand paper surface. If a triangle, T, is held vertically and rubbed back and forth on this board any irregularity in the line L can be smoothed off, giving the finest kind of a surface.

By exerting a little more pressure on one or the other end of the line, we can thus change any one of the angles one way or the other to suit. Thus in Fig. 2, we have a triangle, T, which we know by comparison with other triangles is not true. The angle A being in error. Place the triangle against the straight edge X-Y as shown and drawn the line 0-1, turn the triangle through 180 degrees, and then draw the line 0-2, we find that these lines do not coincide. The angle may be

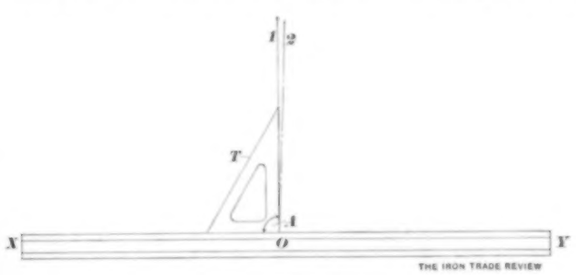


FIG. 2.

greater or less than 90 degrees. In this case it is less. We therefore place the triangle upon the sandpaper board, already referred to, and shave down one or the other of the two sides of the angle A, thus increasing the angle. We will thus draw two other lines which will be found to be close together; we repeat this operation until the first and second line coincide.

Assuming that we have corrected the right angle of each one of our triangles, we then wish to true the 30 and 60 degree angles. First, place the triangle B-1, as in Fig. 3, draw the lines 0-0 and 0-1, then swing the triangle around to the position B-2 and draw the line 0-2. The first and second line do not coincide. In this case the angle C is less than 30 degrees. The edge D is therefore placed upon the sand paper board and shaved down so as to increase the angle C. Then draw trial lines as before, repeating this operation until the first and second line coincide. The 60 degree triangle is now trued up.

In order to true up the 45 degree angle, draw a line P-3, with the triangle as shown and then turn the triangle upside down and draw the line P-4; then shave down the edge A one way or the other to suit. Continue the operation until the lines coincide.

In order to true up a straight edge X-Y, Fig. 4, we first draw the line 1-2 with a sharp, chisel-pointed pencil. Turn the straight edge upside down and draw the line 3-4. These lines will not coincide if the straight edge is not true, note the high

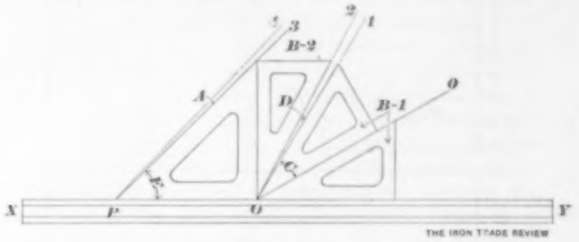


FIG. 3.

spots as at A, place the straight edge upon the sand paper board and gradually work this spot down. Then draw a new set of lines, mark the high spots and work them down as before and continue this operation until the lines coincide. Of course this must be done with the other side of the straight edge.

Once the straight edge is trued up and not in use, it should always be suspended from some kind of hook in the hole H which is usually provided.

The drawing board edge against which the tee square is placed is ordinarily out of true. This irregularity is com-

FIG. 4.

paratively small. The high spots may be removed with the sand paper board. By placing the edge of the straight edge along the board, we can readily pick out the high spots and by sand papering them off we are enabled to get a true surface. The next thing which gives a world of trouble is the tee square. There are scarcely two tee squares in any drawing room which will line up with each other. This thing is not only true of old instruments, for I have seen quantities of new tee squares which were more or less out of true. Of course with this condition of affairs, it is impossible for one to lay down the work with his tee square and have another person trace it, as the blades will not line up. B in Fig. 5 is

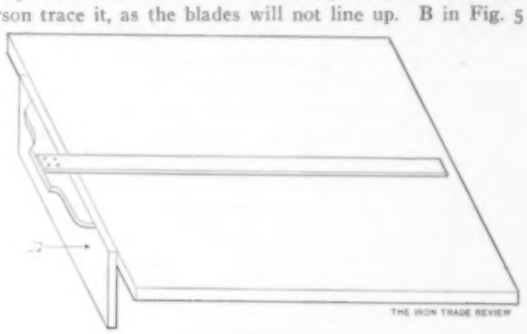


FIG. 5.

a sand paper board which is an excellent thing for truing up the tee square. We will assume that the blade has been trued up by the method already given. Draw a line A-B, Fig. 6, with the straight edge at a distance C from the edge, this distance is conveniently made equal to the width of the straight edge. Strike a set of arcs at F and G and draw the line D-E. This line will be at right angles to the edge of the drawing board. We will now line our tee square up with D-E and note which way the blade is out of true, then shave down the tee square on the sand paper board, Fig. 5, and compare it again with this line; by continuing this process we will

soon have the blade line up perfectly with D-E. The angle K should be a right angle if possible, as it is convenient to square lines from edges across the board.

The reason that so many of the lines on drawings are ragged is that the drawing pens are in bad condition. Fig. 7 represents a pen with a hinge at H. This style of pen is more expensive than a solid pen and also brings with it the disadvantage that if the fit is not a perfect one the blade B will move back and forth at the point. The joint should be riveted with a very light hammer so as to take up the slack.

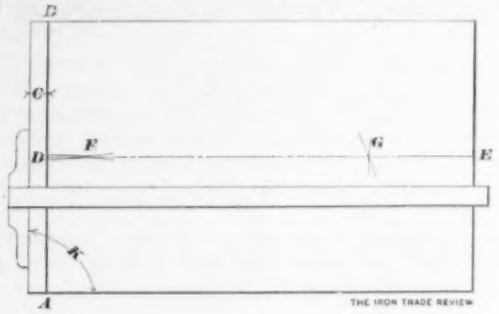


FIG. 6.

The principal trouble about this style of pen is due to insufficient spring in the blades. This can be overcome by opening the blade and gluing one or more pieces of paper, P, to the body as shown so as to give the required tension. With a solid pen we do not have this trouble and for the ordinary run of work a solid pen is as good a thing as one could desire.

In order to sharpen the pen we must bear in mind that the ends of the blades must be exactly the same length. This is done by rubbing the pen back and forth, as indicated in Fig. 8, upon an oil stone O. After the two blades have been

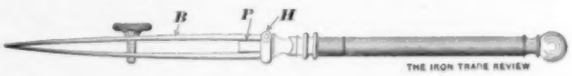


FIG. 7.

brought down to the same length, we open up the screw so as to be able to sharpen each blade separately.

In reference to the oil stone to be used I would say that it is not necessary to have a razor hone as they cut entirely too slow, and secondly, we do not want any razor edge on any of our drawing instruments. An ordinary oil stone which will cut rapidly is all that is needed. Use the stone dry, only using oil for washing off the steel particles which cling to the stone. One is able to see at all times the condition of the edge of the pen. We will proceed to sharpen the blades. Place the pen upon the stone as indicated in Fig. 9 and rub it back

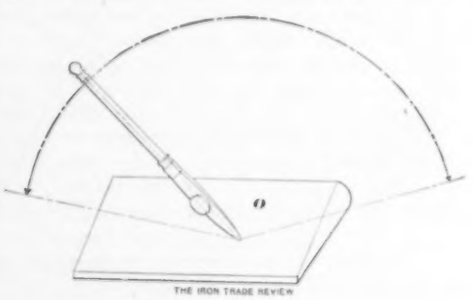


FIG. 8.

and forth or circular and gradually work down the flat edge which is made in the first operation. By occasionally wiping away the particles from the point and holding it up toward the light, we are able to see the flat surface gradually diminish. Continue this operation until the flat edge has entirely disappeared. Then stop. Repeat this operation on the other blade. Never use the oil stone between the blades as this surface is always put in good condition by the instrument makers. This pen is not yet fit for tracing as it will cut or scratch the tracing cloth. Take a small sand rubber and draw the pen back and forth over it in exactly the same manner as in Fig. 8, pressing the sharp edges down into the sand rubber. Draw this back and forth several times and then try the edge on tracing cloth, it may be found to cut or scratch but not as much as in the beginning. By repeating this operation and occasionally trying the pen on the tracing cloth, we are enabled to get a smooth point and one which will give a fine clear cut line. You will find that this pen will work perfectly at the first trial.

In using the pen for some time and especially if it is always used in the same way, one blade will wear faster than

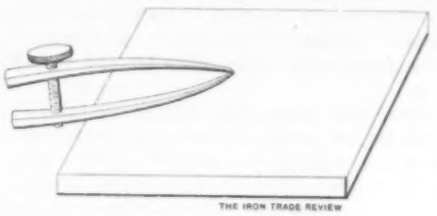


FIG. 9.

the other and finally the pen will not work well. This can be detected in the manner shown in Fig. 10. Hold the pen as indicated and slide the finger nail along one blade as shown by the line A-B. Then slide it along the other blade in a similar manner. We can thus readily find which blade is the longer. We may then apply the pen to the oil stone until the difference disappears.

Of course all this applies to any style of pen as the bow pen, beam compass pen, etc.

The needle point for the dividers should always be arranged

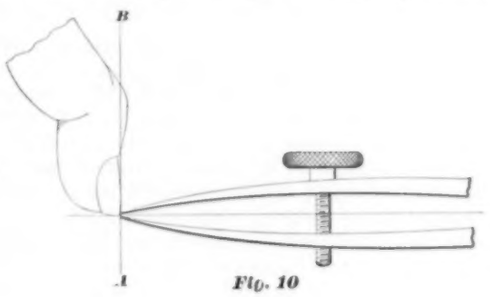
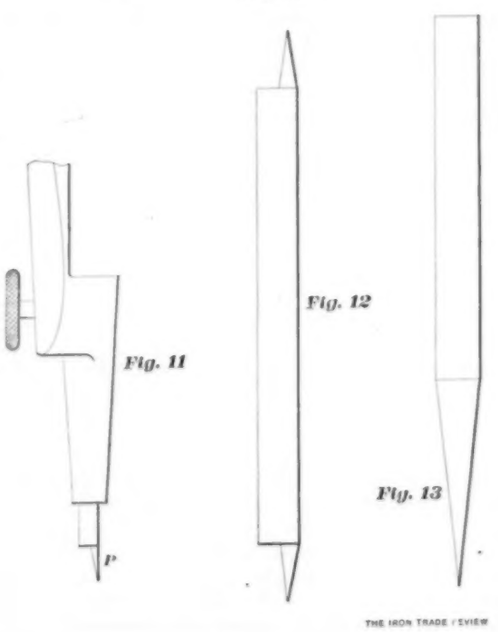


Fig. 10



as shown in Fig. 11, where the point P is on the inside. Fig. 12 shows the usual arrangement of these points. They are cheap and can be gotten to fit almost any instrument. The custom of using the points shown in Fig. 13 is bad on account of the fact that this point will dig a wretched hole into the drawing when striking a circle. It gradually bores and digs its way down into the board, which is a thing we never see with the point shown in Fig. 12.

CUSTOMERS' ORDERS.

BY KENNETH FALCONER.

A system planned to meet temporary conditions is sometimes permanently adopted because found, when circumstances have again become normal, to be superior to those methods which it was designed to supersede temporarily. The following plan for keeping in close touch with customers' orders is a case in point. It was hurriedly devised after a disastrous fire, with goods being manufactured at and shipped from three different points in the city in which the offices were located.

The requirements were that the shipping clerks should be enabled to keep a close watch upon the orders in their possession, and any part shipments made on account thereof; that

FIG. 1.—THE ORDER REGISTER.

the offices should have copies of all orders, and should know what part, if any, had been supplied; that an order once received, there should be no possibility of it being lost in transfer between the office and the other departments or stores; and finally that a shipment once being recorded by the clerk in charge at any of the shipping points, it should be absolutely certain that a charge against the customer should be made therefor. It was also desired that any unnecessary delay between date of shipment and billing of the goods should be automatically forced on the attention of those in charge at the general office. Slightly modified, the system designed to meet these requirements is found most satisfactory, now that all shops and departments, as well as the offices, are in the same building.

Customers' orders are divided into two classes—"petty" and "regular," known locally as "P." and "R." orders. As the name would imply, petty orders are those not deemed important enough to be made a matter of permanent record. If an order is received for goods which may or may not be

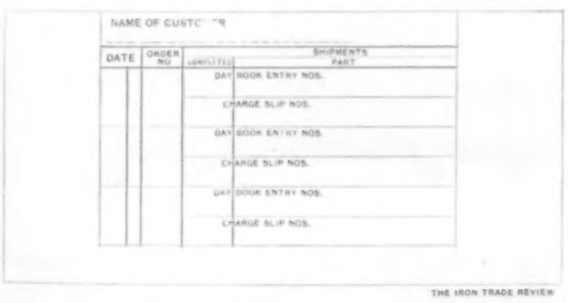


FIG. 2.—CARD INDEX OF ORDERS. ACTUAL SIZE, 6 X 9 INCHES. FOR CLEARNESS THE SPACING IS MUCH LARGER THAN IN ACTUAL USE.

supplied, and which in any event may be the subject of correspondence, it is an "R." order, quite irrespective of value or quantity. If, however, it is simply an order for a small repair job, or some petty article from stock, it is designated a "P." order, and after the goods are supplied or the work done no permanent record is kept of it other than charging customer.

Fig. 1 shows the ruling of the order register kept at the head office. This is simply a book containing a list of all orders arranged numerically, showing date, customer's name and when received, with a column to show the date of completion.

In connection with this book a card index is kept of which Fig. 2 is an example. On this index only "R." orders are recorded. On receipt of an order it is entered in the register and given the first blank number with the prefix "R." or "P." as determined. It is an "R" order, a copy is made and sent to the shipper, the original being retained by the office, filed in a self-indexing, loose leaf cabinet. If the order number has been given the prefix "P.," the original is sent direct to the shipping department, no copy being kept in the office.

A charge slip, Fig. 3, is made out for each and every shipment or delivery of goods. This form is put up in books of 100, numbered consecutively in duplicate with the original perforated for removal. (In the case of out-of-town shipments a third copy is secured by the use of full carbon. This is sent at once to the customer, thus enabling the goods to be checked upon receipt without waiting for the invoice which follows.) As the charge slips are filled out the articles supplied are marked off on the order. The original charge slip is sent at the close of each day to the office, marked either "part shipment" or "completed," as the case may be. Any shipments on account of orders are there noted on the original of the order, the charge slip number being marked opposite the items. These orders upon which part shipments have been made are returned to the filing cabinet, and those completed are filed permanently away. The charge slips are then priced and billed to customer, the entry number marked on them, and then put away, arranged according to charge slip number.

To keep in close touch with customers' orders we thus have the order register, Fig. 1. Close watch upon this book, constant comparison between date received and date completed columns, and persistent following up of any order remaining incomplete an unreasonable length of time, tends toward prompt and early shipments.

The order index, Fix. 2. This card index serves several purposes, both of record and of indexing. An occasional ex-

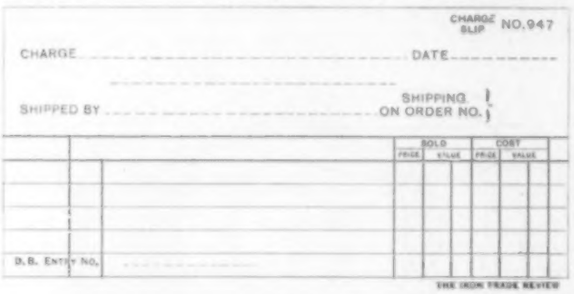


FIG. 3.—CHARGE SLIP. ACTUAL SIZE, 8½ X 11 INCHES. DUPLICATE IS SAME RULING, BUT WITHOUT COLUMNS FOR PRICE AND VALUE. IN CASE OF TRIPLICATE BEING USED AND SENT TO CUSTOMER IT IS SAME AS DUPLICATE, BUT WITH SUITABLE PRINTED HEADING.

amination of the dates of the orders found on each customer's card will prove of value to the selling staff as showing where it may be well to make special efforts to retain an evidently failing connection. A glance at the card of any individual customer will also show how many uncompleted orders from such customer are on hand, the date they were received, and if any part shipments have been made. In this respect it is also an index of both filled and unfilled orders for any customer, should information in that direction be desired; it is an index to the day book where particulars of any charge may be found. In this connection it might be well to say that from the time this system was adopted all entries in the day book were entered consecutively with the prefix A for the first year, B for the second year, etc. Thus supposing A to represent 1903, A7111 would mean "Entry No. 7111" in the sales book for that year. E8754 will mean "Entry No. 8754" in the sales book for 1907.

As an index of the shipping slips these cards are useful in two ways—if the office staff required to turn up the original of any entry to see the cost or profit of a certain charge, or if the shipping department wish to look up past records of shipments. In the latter case it is the books containing the duplicates (which are kept in the shipping department) which are consulted. In the former case the original charge slip is looked up. These charge slips being filed away numerically, it follows that it is quite impossible to fail to make an entry in the sales book for any shipment if the charge slip has been made out in the shipping room. The absence of any slip will at once be noticed, and if it should by any possibility have been

lost or destroyed a duplicate can be secured from the shipper's copy.

The filing cabinet in the office, in which the original of the "R" orders is kept, is a record of all unfilled orders on hand alphabetically arranged, those for each customer being together. If a part shipment has been made it is shown on the face of the orders, and the balance still unsupplied can be readily seen. Should it be desirable to look up the entries for any given order, the charge slip numbers opposite each item will show the year and the number of the entry in the day book where particulars may be found. It might be mentioned that in the case of orders secured by traveling salesmen, the original for this cabinet and the copy for the shipping department are obtained by the simple method of having duplicate copies of the orders sent in by the travelers. In many cases also customers are supplied with a similar form put up on the fold-over principle in such a manner that three copies are obtained with the one writing, two being sent in to us, and the third retained by the customer.

THE USE OF FORMING TOOLS.

BY FRANK B. KLEINHANS.

It is in dealing with large quantities that we are enabled to bring down the price of the manufactured product. Thus if we are obliged to make five pieces of the same size and shape, each piece will cost us less than if we were to make only the one piece. Where things are made up in lots of a thousand, or even a hundred, the cost is reduced wonderfully. In this article it is intended to show a method for duplicating parts on a lathe by means of forming tools. Thus a manufacturing concern which uses a great variety of turned handles

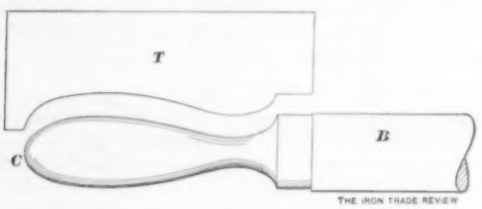


FIG. 1.

can greatly reduce the cost per handle by making a forming tool as at T, Fig. 1.

This tool can be used in any one of a number of different machines, thus it may be clamped by a fixture to the rest of any ordinary lathe and is then gradually fed into the work. The work would either pass through a hollow spindle and be held by a chuck or else it would be entered between centers and driven by means of a lathe carrier. The tool T in this case would have to be cut away on the rear end to clear the center. The most convenient way of doing a job of this sort is either in a chucking lathe or in a turret lathe. B is a long rough bar which is pushed through the hollow spindle and is allowed to project a sufficient distance beyond the end of the chuck for forming. The tool T is then fed into the work by hand until the required diameter is attained. The

FIG. 2.

tool T, it will be noticed, is arranged so that the forming edge is carried up to the center C, thus finishing the handle complete. In order to do this properly, we must keep a good flow of oil on the stock. This is most conveniently done by arranging a gas pipe directly over the work. The pipe has a series of holes drilled along the bottom and the flow of oil is regulated by a globe valve. The pipe should be coupled up with flexible joints so that it can be shifted to suit the operator. After the handle is formed, which requires anywhere from 5 to 10 minutes depending upon the size of the handle, the chuck is released and the bar is drawn out against a stop. It is then cut off at such a distance from the finished handle so that one can readily forge down the end as shown in Fig. 2.

These handles are made up in large quantities and when it is desired to use one of them in connection with a long lever, they are heated at the end and drawn down under the steam hammer as shown at A, after which they are welded to the shank to give the desired overall length. The handles are then polished and the other part of the lever is painted. This makes an exceedingly neat handle and one which is comfortable in the hand.

In making these forming tools it is necessary for certain classes of work to have offsets, diameters, etc., absolutely correct, thus the tools must be made with considerable care. In Fig. 3 is shown a sleeve, the diameter at A and B and the length L must be just right. A bushing is first turned up carefully to the exact size desired. This bushing is then shaped out as shown at C and D. The surfaces are planed

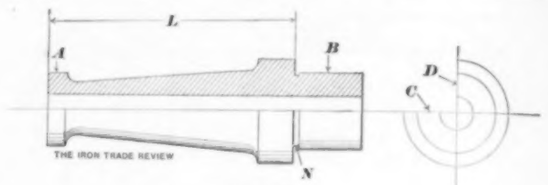


FIG. 3.

smooth and the edges are square. The surface C is laid down upon the face of the forming tool and the contour is scribed off as near as possible to this line, after which this bushing is applied to the surface. Any irregularity of the forming tool will be clearly shown.

The surface is then worked down to a perfect fit. The nick at N is cut in to clear the wheel when the part B is ground to exact size. The economy in the use of forming tools is quite marked in the case of such complicated pieces as are shown in Fig. 4. This is a double bevel gear and was originally made of cast iron, for which a price of five cents a pound was paid. It can be made from the bar which is bought for half that amount, and we can also save the expense of pickling the castings and the cost of setting and machining each one separately. It is impossible to use a forming tool like that shown in Fig. 4 on castings of this sort, as the cutting edge would not hold up for a very long time.

A double bevel gear G is first turned up in the engine lathe so as to be exactly right, it is then shaped out as noted in Fig. 3 and the forming tool T is made up from this. An end-view of the tool is shown at A at which the angle B can

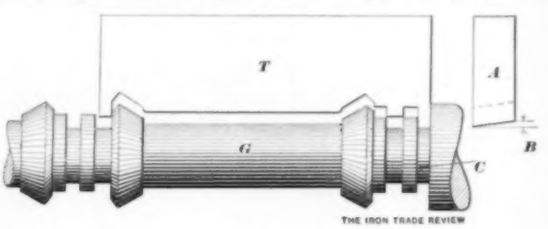


FIG. 4.

readily be seen. This angle is usually made about eight degrees. This work is done in a chucking or a heavy turret lathe after the piece has been formed as indicated in this figure. Instead of cutting it off at the end C, it is moved along and held in a steel rest between a pair of brass jaws so as to support the end while the next gear is being formed and then cut off at the next operation.

These have been given as examples of a great variety of work which can be done with forming tools and we not only make a great saving in the piece of material in changing over from cast iron to cold rolled stock but we also save an enormous amount of time and of course have a much more uniform product than we could obtain in any other way.

The Sloss-Sheffield Steel & Iron Co., has announced that it sold 40,000 tons of pig iron during the first 17 days of November and shipped out even a greater amount. The export trade still continues, but in small volume.

The Manufacture of Accurate Sheet Metal Parts in the Sub-Press.

BY JOSEPH WOODWORTH.

The great increase in the manufacture of innumerable small machines of precision, which are made up almost entirely of sheet metal parts, together with the increasing demand for cheap but accurate watches, clocks, time recorders, meters, cyclometers and other articles, the utility of which depends entirely on their precision, has required accurate presses, dies, feeding devices and automatic arrangements to produce sheet metal parts in endless repetition with their complete interchangeability assured. For the production of such parts, dies of great accuracy, together with positive feeding devices, and the sub-press are necessary.

Sub-presses are distinctly different from the presses which are used for the ordinary lines of sheet metal work, in that they are made so as to form component parts of the dies, and are used almost exclusively for the delicate and expensive dies which are required in the economical manufacture of parts of the kind used in the machines referred to above.

Notwithstanding the extensive use to which the sub-press and its accurately made compound dies have been put, its purpose and the making of dies for it are not understood by superintendents and tool-makers of sheet metal goods factories as they should be. Were the case otherwise, and the utility of the sub-press and the making of its dies more gen-

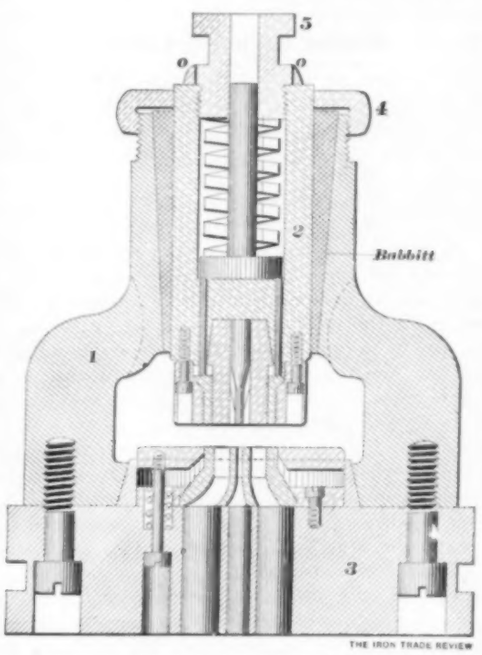


FIG. 1.—VERTICAL SECTION OF SUB-PRESS COMPLETE. DIES IN POSITION.

erally understood, there would be less worry and more satisfaction in the accomplishment of results which, in many establishments, are at present being done by means which are now obsolete. In view of this state of affairs I feel that complete descriptions of the sub-press and of the approved methods in vogue for constructing dies for it will be of value and interest to all engaged in the manufacture of sheet metal parts.

The Construction of the Sub-Press.

The principal use of the sub-press is for the manufacture of sheet metal parts which, because of their unusual accuracy, have to be produced in dies which cut the outside and the inside simultaneously, or at least within the one compound die. By the use of the sub-press and its accurately made dies the finest work can be accomplished with ease, as the dies may always be kept closely adjusted for the work while the alignment will be perfect, and thus there will be no possibility of shearing.

In regard to the cost of a sub-press and a pair of dies for producing an intricate sheet metal part, the first outlay is considerable; but then this is really all the cost, as the construction of the press is such that no damage can be done to it while it is being set up or run in the power press, and the dies require but little repairs other than of occasional grinding of the faces. When it is stated that from 50,000 to 100,000 perfectly interchangeable blanks can be cut and pierced in a sub-press without grinding the punch and die faces the accuracy and longevity of the tools may be imagined.

In order to construct a sub-press or a set of dies for it the toolmaker must be both skillful and accurate, and must use great judgment; possessing these qualities he may, by carefully observing the following methods, be sure of success.

Fig. 1 shows a vertical section, and Fig. 2 a plan, of a sub-press. The sub-press consists of the stand 1, the plunger 2, the base 3 and the nut 4, to tighten the babbitt lining. The stand, 1, is the first part machined. It is faced on the bottom and bored, then the barrel is faced and recessed to suit a flange, by means of which the plunger 2 is centered at one end for babbitting. The stand is then ready to be drilled and tapped for fillister head screws, by which it is fastened to the base. These screws are also used to fasten the stand to a special lathe chuck and bored 3 degrees taper, faced on the end and turned for the adjusting nut, but not threaded until the stand has been babbitted. The stand having been bored, it is then set up on the shaper or keyseater and four grooves are planed on the inside, parallel with the taper, to prevent the babbitt from turning.

We now rough turn the plunger 2, back-rest and bore it for the punch piston; after which it can be threaded for the nut 5. This should be made of machinery steel, having two flats milled on it at o-o, so as to be able to remove it from the plunger. With the button well screwed down, the plunger should be turned to within .005 inch and then ground to size, making sure to have it perfectly parallel; after which it

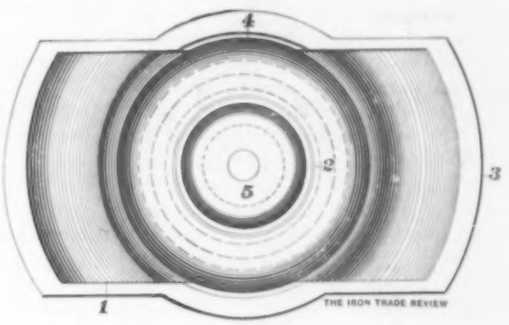


FIG. 2.—PLAN OF SUB-PRESS.

should be placed in the milling vise, and four grooves milled in it, being sure to have the miller vise exactly in line, or a twisting motion will occur in the plunger, and this will, of course, spoil the die. Now we draw-file the plunger, using No. 2 emery stick, which will give better results than a file, and all is ready for babbitting. We allow the babbitt to rise ⅛ inch above the stand.

As soon as the stand has cooled enough to handle, the plunger should be forced down far enough to allow the babbitt to be faced and squared off on the end, and the thread cut on the end of the stand for nut 4. The plunger is removed from the stand, and the latter located on the special chuck in the lathe again, and a spiral oil groove, of about 1-inch pitch, cut in the babbitt lining. The stand and plunger should now be secured in a power press, and pumped, using plenty of oil, and tightening down the nut occasionally so as to get a good bearing. It must be watched at this stage, in order that excessive friction may not heat the babbitt lining sufficiently to cause it to swell, and thus destroy the stand. Now reface the stand in the lathe and face the bottom and bore the seat about 3 degrees taper to fit over the taper boss on the base. The plunger may now be removed from the stand, back-rested and recessed for the dies. The base can then be located on the face-plate of a lathe—having previously planed the bottom, and the boss turned 3 degrees taper to suit the stand; also recessed for the dies and lower stripper, after

which it can be drilled, counterbored, and then dowelled, to secure the perfect alignment of the two sections.

Setting and Working a Sub-Press.

The sub-press can be worked in almost any power press of suitable space. However, a special press is often used for the purpose, as a short stroke and a stiff arch framed press best meet the requirements. Fig. 3 shows a press of this kind.

To set a sub-press, simply slip it into place, as shown in Fig. 3, by sliding the steel neck of the plunger into the press slide hook and then locate the holding-down clamps into their places and tighten the screws or nuts, thus fastening the sub-press firmly to the bed of the power press or bolster plate. The dies may now be set and all is ready to proceed with the punching. The changing of sub-press is very quickly done, as no special skill is required. There are several different styles of sub-press frames; the most common is the round barred arch shape. However, an overhang pattern is often

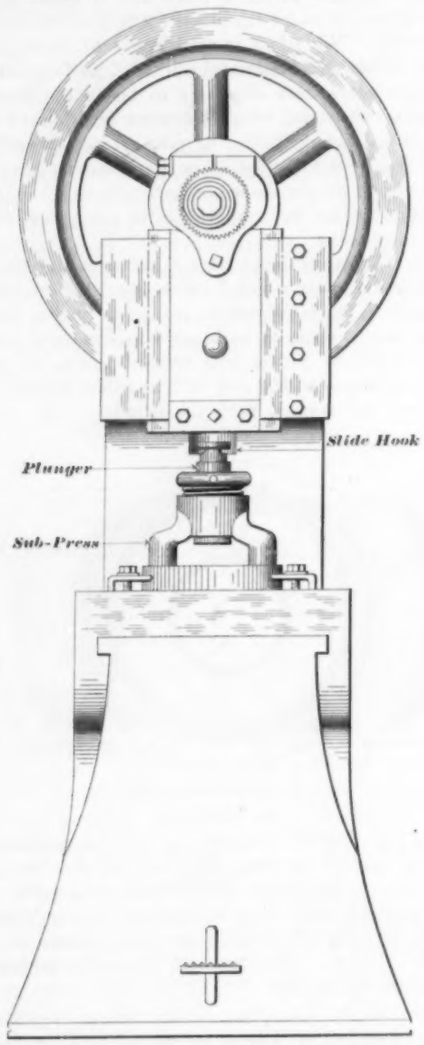


FIG. 3.—WATCH PRESS WITH SUB-PRESS LOCATED READY FOR WORK.

used. For the very largest work, such as clock or time-register frame backs, four-pillar sub-presses, which cut quite large blanks from stock as thick as 3-16 inch, are used. The manner in which the punching in a sub-press is done must not be confounded with ordinary punching, as it is handled in a different manner. As a rule, three or more operations are performed at one stroke of the press—that is, cutting the outside, cutting the center, perforating the blank and lettering it. The stock to be punched is securely held between the stripper plates and pads; thus the die is compound, and the metal is straightened and held perfectly flat while being worked upon, and each and every piece produced is an exact counterpart of the one previously cut.

Action of the Dies—Feeding of the Metal.

In the production of the most accurate classes of work in the sub-press the punch does not enter the die proper, but descends within a shade of its face, thus parting the blank from the stock and no more; the strippers flatten its edges out square. It must be understood, though, that the die and punch faces must be perfectly flat and without any shear in order for the work to be produced accurately; for this reason a stiff, well made press, is required. Because of constructing the dies in this manner their longevity is greatly extended, as the punches merely pass through the comparatively soft stock and not in and out of the hardened dies, which would shear and wear them quite rapidly. Never, under any circumstances, allow the punches to enter the dies, as this will spoil the tools in a short time.

As the sub-press is a small convenient machine in itself, with its dies and punches always in perfect alignment, with no possibility of getting out of order, it is always set ready for work and all chance of bad or inaccurate work is eliminated. While the first cost of this little machine is large, in the long run it is the cheapest die that can be devised for the rapid production of perfectly interchangeable sheet metal parts. It is to this little tool that we owe the honor of making possible the "dollar watch."

Roll feeds, or other automatic feeding appliances, are often added to the presses in which these sub-press tools are used. As the articles cut are forced back into their place in the stock from which they were punched by the stripper in the dies, the metal stock is kept straight and is positively and accurately fed along under the dies at a very high speed, from 75 to 130 punchings per minute being produced.

American Pig Iron in Canada.

Samuel Coulson, of H. R. Ives & Co., Montreal, has answered the recent interview of Fresident Drummond of the Canadian Manufacturers' Association, who advocated raising the duty on pig iron imported into Canada from the United States. Mr. Coulson says:

"Mr. Drummond's remarks in so far as they relate to pig iron are misleading. At the outset I may state that in our works we use not less than 3,000 tons of pig iron per annum, and naturally buy our iron in the cheapest market. For over two years past we have not been able to purchase a pound of pig iron in the United States. In that time 75 percent of the pig iron used by us came from England, the rest was Canadian. Recently our American friends have been writing us to know if we were not able to buy at present prices, their quotations as late as October 29th being as follows: No. 1 soft, $19.67 per gross ton, f. o. b. cars Montreal, duty paid, terms 30 days; No. 2 foundry, $19.17; No. 3, $18.67; No. 4, $18.17. The foregoing quotations compare with English and Scotch iron now in our yards as follows: No. 1 Summerlee, $19.50; No. 1 Ayresome, $19; No. 1 Carnbroe, $18.45; No. 1 Middlesboro', $16.75; terms four months.

"Taking one with the other, we consider the brands of English and Scotch iron mentioned as being worth fully $1 per ton more for our purposes than the American brands quoted. Mr. Drummond does not make himself very clear as to whether he is opposed to the preference now being given to England. He also neglected to mention that Canadian manufacturers of pig iron up to the last session of Parliament were entitled to and collected bounties amounting to $3 per ton. I think these bounties are now on a sliding scale, but have yet five or six years to run before they cease. If the quotations for pig iron that we have had from our friends at Sydney this month, hold good it will be many a long day before the Americans will be able to sell the same product in Canada."

Asked as to the position of the Dominion Iron & Steel Co. in the Canadian market, Mr. Coulson said: "Recently the Dominion Iron & Steel Co. have been quoting prices for pig iron that will give them the Canadian market. These quotations they are willing to guarantee all through 1904. Had they put their pig iron on the Canadian market in the first place at reasonable prices there would have been no foreign iron of any kind imported. The truth is if it had not been for the British output the manufacturers here would have had to use pig iron manipulated to the death in prices by both the American and Canadian smelters."

The Alice furnace of the Tennessee Coal, Iron & Railroad Co. has been shut down as a part of the curtailment plan. Some repair work will be done on the furnace.

Who Owns an Invention Made by an Employee ?*

BY WILLIAM M. SWAN.

The various divisions and phases of this subject which may be created by the existence and terms of a contract make it necessary to examine it under various subheads:

(a) What are the relative rights of employer and employe when the employment is general and the invention does not relate to the employment?

While an employe is in honor bound to devote his time during working hours to his specific task, it is but natural that a workman of an inventive turn of mind should at some time or other conceive of an improvement in some machine or article which has come under his observation, and which he has worked out to a practical stage, in part during his leisure hours, and in part during working hours. His neglect of his duties for this purpose during working hours might properly be made the subject of reproof, docking of wages, or even dismissal, if discovered while his investigations were going on. But if he succeeds in perfecting his invention and secures a patent thereon, his employer, on then discovering what his workman has been doing, cannot claim title to or any rights under the patent; that is now vested in the employe. Any other rule would work great injustice to workers in general, and would seriously diminish inventive activity, which it is the expressed policy of the law to promote and encourage.

(b) To what extent is this altered when the invention in question relates to the line of work in which the man is employed? In other words, when a workman in the ordinary course of performing his assigned duties, e. g., operating a machine, perceives and develops to a practical result a possible improvement in some feature or step of the process, whose property is the patent secured thereon?

If, on the one hand, the rule were adopted that all such improvements belong to the employer and this were carried to its last analysis, it would mean that, aside from individual cases specifically covered by a contract, no employe of any grade could ever claim for himself and receive the benefits of any invention relating to any phase of his employment. The harshness and injustice of such a rule is self-evident.

On the other hand, should such improvement be declared under all circumstances the property of the employe, this would, in effect, furnish the employe with all the needed material for the ground work or basis of his invention—the machine at which he works in its then stage of development. And it would enable the workman to dictate the price which the employer must pay for the addition of such improvements to his apparatus, at the same time giving to the workman the club of a threatened sale of his invention to a rival manufacturer, if his terms are not accepted.

Since, independent of contract provisions, a workman is entitled to a patent on the result of his inventive efforts, the employer's greatest safeguard lies in securing to himself by contract when the workman enters his employ, all such benefits, either by providing for an absolute assignment of all such patents to him, or an agreement for license as to their use by him and in his factory.

In the absence of an agreement, if a workman has installed the improvement devised by him in his employer's shop or factory, this operates as a license from him to the employer as long as he remains in his employ or until the specific article is worn out. However, on quitting such employ, unless by his conduct he has given his employer to understand otherwise, he may commence to collect royalties for his (the employer's) continued use or sale of it, except as above stated, or may prohibit it entirely. He must do this promptly or he will be adjudged guilty of laches and his claim to compensation denied.

If, after disclosing to his employer his invention, for the use of which he requests pay, he is met with a refusal, he must act vigorously in the matter and not be content with protesting. If he allows his invention to be used after this, and continues in the same employ, the employe's conduct is equivalent to a license to make use of his invention, which would operate as a bar to his subsequent recovery of a royalty or damages.

But an employe cannot secretly install his invention in his employer's shop, and after the lapse of a considerable time claim compensation for its use as if the employer had investigated and adopted it when it was first developed. His action must be open and frank. By silence he is deemed to have granted an implied license to his employer to use it.

The mere fact that the inventor is an employe does not in and of itself give the employer the right to demand or presume, without further compensation, a license to make use of his workman's invention, either the one machine constructed by the workman in developing his invention, or as many others modeled after it, as the needs of the business may necessitate. Indeed, the workman is at liberty to sell to others or keep absolutely to himself the patented invention, for in this country an inventor is not bound to produce and sell the article upon which he has secured his patent. In other words, there is no forfeiture for non-use. But it is reasonable to suppose that if he sold the patent rights to his invention to a business rival of his employer's, little time would elapse between his employer's discovery of this and the receipt by him of notice that his services would no longer be required.

(c) When the employe is hired to use his skill in a special work, but no mention is made of any particular inventions:

Unless some particular arrangement is made for vesting in the employer the title to whatever patents an employe hired under these circumstances shall receive, the employer is held to have, by virtue of the contract of hiring, an implied and irrevocable license to use them. This license is non-assignable and if the employer is a corporation, on its dissolution reverts to the inventor. In the absence of special arrangement, the inventing employe retains title and is free to use the inventions elsewhere or grant license to others, should he leave the service of his first employer. Since the terms of the contract of hiring are for the inventor's investigations in a special line, he is precluded from creating other licenses to use his invention while still employed in his first situation.

If the patent is for a process, this license to the first employer is for its repeated use; but if it is for a machine in use by the employer it is confined to the one or ones already installed. If the patent is on articles produced for sale, no license for a continuation of the produce or sale arises.

(d) When the employe is hired to construct or mechanically develop an invention, i. e., to make models or machines:

If one in whose mind the idea of an invention has been developed and exists, sees fit, for some reason or other, to entrust the manual labor of preparing working models to another, together with the necessary and appurtenant secrets of the work, he does not thereby constitute the other an employe whose work in developing the inventor's ideas becomes his (the employe's) own. Unless in the course of executing his master's orders the workman effects and works out changes and improvements upon the idea as outlined to him by the inventor, which are, in and of themselves, of such a grade as to take rank as an invention, the first idea still prevails. The very terms of hiring and the necessary conditions of such a contract should preclude the idea that the completed machine is to stand, when completed, as other than the invention of him who first conceived it. If any other rule were allowed to prevail, it would be unsafe for the superintendent of a manufacturing institution to entrust to any workman the ordinary preparations for and detail work upon any new article whose manufacture was contemplated.

Suppose, however, that after the experimenting for which the inventor was first employed has been completed to the satisfaction of the employer, and a patent has been duly secured. Is the inventor at liberty to use the results so far attained as a basis for further experiments, additions and improvements, whose nature and scope are such as to merit a separate patent? Is this his, or must it inure to the benefit of his employer? The answer to this is under two heads:

1. If the patent secured by the employer, and upon which the inventor was employed as a mere workman under super-

*This article has been prepared under the supervision of Parker & Burton, attorneys in patent causes, Detroit, and will be reprinted by them with complete citations from legal records. The article has been condensed to the extent of omitting the purely technical law references to decisions, and in its present form will be found a valuable digest of the data pertaining to a most important subject.

vision, concerns a machine or manufactured article, the exclusive rights to which during the lifetime of the patent belong to the employer, the only means by which the inventing employe can lawfully turn out articles embodying his invention is by outright purchase of individual specimens from his former employer or by arrangement with him as to royalties for the privilege of making such himself. With a clear title to a machine or manufactured article in this State he is then at liberty to do absolutely what he pleases with it—destroy it or develop it to the point of greater utility made possible by his additional invention.

If the employer neglects or refuses to manufacture in accordance with his patent, so far as machine or articles of this particular type are concerned, the inventing employe, who desires them for the further work involved by his invention, is at his mercy, for he (the employe) can be enjoined fron making them himself.

2. If the first patent is for a process, with which the employe was, in the natural course of his duties, made entirely familiar, it would seem that the position of employer and employe with reference to subsequent further inventions by the employe along the same line is analogous to that of *employe* and *employer* discussed under (b), i. e., while the title to the process as first developed and patented belongs to the then employer. The fact of the inventing employe having been at work upon and acquainted with the process operate

machine invented, supposing this to be the subject of the patent, after the inventing employe has left his service, is not limited to the specific machine or article contrived by the inventor while still in his employ. It is fair to presume that, in employing the inventor to devise improvements, the employer had in mind the permanent improvement of his plant not merely the temporary step in advance made possible so long as the new machine lasted, with a return, on its wearing out, to the old objectionable methods. From this it seems but fair to reason that the first employer's license would be a continuing one, for the lifetime of the patent, to make use and sell as he saw fit and as the needs of his business demanded. He would simply be precluded from enjoining others, including his former employe and his licensees, from making use of the matter.

(f) When an employe is hired to devote his inventive energies and ability in a specific direction, however, the rule changes. A contract of this kind is, in effect, one of bargain and sale, the consideration on the one hand being the salary paid, and on the other the transfer of title to all patents secured as a result of the employe's efforts. This is, in a way, analogous to (d), but of a higher grade, the work being rea invention, in a narrow and clearly defined field, which, bu for the express contract to the contrary, the inventor could have retained for his own use and benefit. The words of Mr. Justice Brewer, in the case of Solomons vs. U. S. 137, U. S.

FIG. 1. - VIEW OF THE PALACE OF MACHINERY, LOOKING NORTH FROM THE CASCADES.

to grant him a license to use his knowledge of the primary process in the development of his own further ideas, although not as patented and no more; this license would be strictly personal and unassignable, so that the inventing employe could not sell his rights in the process as developed and patented by him, nor grant licenses under it, nor would this license descend to his heirs or personal representatives.

(e) If the employe is hired to invent generally, no mention being made of the ownership of the title of any patents he may secure, the arrangement is construed to operate merely as a license to the employer to make use of all of his employe's contrivances. The adjudged cases seem to indicate that if the contract is silent on the subject, title to the patent should remain in the employe who actually did the inventing.

But the fact of his having been employed to effect these improvements in the employer's factory would operate to vest in the employer a license to continue to make, use and sell even after the inventor had left his employ. The license would, of course, be untransferable and strictly personal to the former employer and those he saw fit to employ. This right would be a mere "shop right," to make use in his own shop, and only there, of the entire invention; that is to say, the fountain head of any and all other licenses would be the inventing employe.

The very nature of the contract of hiring shows that, unlike the situation and resulting rule of (b), the right as to the

342, at page 346, express this idea with great clearness. He says:

"If one is employed to devise or perfect an instrument, or a means for accomplishing a prescribed result, he cannot, after successfully accomplishing the work for which he was employed, plead title thereto as against his employer. That which he has been employed and paid to accomplish becomes, when accomplished, the property of his employer."

Some of the cases on this point seem to state that while the employer has an indefeasible right to the use of the patent, the title thereto is still vested in the real inventor, so that the relation of the two is still inventor and licensee. This is true in so far as it indicates that a formal assignment by the employe is necessary to vest title completely in the employer The contract between employer and employe does not of itself operate to transfer the title to patents secured. It is simply an executory contract by the employe to convey when secured. But otherwise they are controlled by the clear enunciation of Mr. Justice Brewer, quoted above. And in McAleer vs. U. S. 150, U. S. 424, the principle is enunciated, although really only a specific application of the basic rule of evidence, that when an assignment absolute in form has been executed by an inventor in favor of his employer, it cannot be shaken by parol evidence that it was understood and agreed that the assignment was only to hold good so long as the inventor retained his position.

Can an employe who has made an invention be compelled to apply for a patent? Independently of a contract, no. The employer who has vainly urged his workman to take out a patent cannot apply in his stead, for he cannot swear that he was the original inventor or the assignee of his rights. With a knowledge of the invention gained from the employe he may put it to use in his establishment in the absence of objections by the employe, but further than this he cannot go. If, however, the contract of hiring contains provisions as to patents for any inventions made by the employe, if the contract is not unconscionable, the obdurate employe may be compelled to perform specifically his obligations. And the terms of such a contract should be so precise as that neither party could reasonably misunderstand them.

The Patent Office is not the proper forum for the settlement of disputes as to contracts for the conveyance of interests in letters patent. As to these a court of equity should be invoked to decree specific performance of the contract. Nor is this confined to cases involving already existing patents. If the provisions of the contract to convey are sufficiently definite and explicit, specific performance will be decreed of a contract to assign a patent before the application has been acted upon and the patent issued.

A meeting of machine screw manufacturers was held at Buffalo last week, and about 25 companies were represented. The manufacturers have a meeting about once every 60 days, and this was one of the usual meetings. Present conditions of the business of the companies was discussed, but no unusual action was taken.

The Koken Iron Works, St. Louis, whose pattern shop was recently destroyed by fire, will rebuild. The company does not contemplate any decided change in construction.

THE PALACE OF MACHINERY AT ST. LOUIS.

The accompanying cuts are recent views of the Palace of Machinery at the Louisiana Purchase Exposition, St. Louis. Fig. 1 shows a view of the structure looking north from the cascades, and Fig. 2 is a corner of the same building. The two illustrations give a very good idea of the state of progress made with the buildings up to the present time and convey also an excellent impression of the imposing character of the architecture.

Machine Tool Trade in Germany.

In view of the renewed attention American machine tool ers are giving to the export trade, German buyers among others being solicited, the status of the machinery trade in that country is of interest. There appears to be an improvement in German industry generally, after several years of depression,

FIG. 2.—A CORNER OF THE PALACE OF MACHINERY.

but there is room for much more. There has been an increased in the number of men employed in the machine tool trade, and at a recent meeting of the Association of German Machine Tool Makers it was stated that general business had become somewhat brisker. Owing to the keen competition, due partly to other works taking up this particular branch of trade, and to the fact that the demand for machine-tools is not yet equal to the considerably increased capacity of the works, the prices obtained, however, scarcely cover the cost of manufacture—in fact, in many cases the works are losing money. The slightly more active demand should help to remedy this, but the position is still depressed, especially as some of the important classes of users have still to cope with unsatisfactory trade. The demands of many rolling-mills when ordering machines for return orders for their products from the machine-tool works place difficulties in the way of business. As employment at the iron and steel works improves it is hoped that this will be removed.

The Premium System in Practice.

BY CHARLES B. COOK.

The writer, being aware of the great interest of manufacturers throughout the country in the premium system, is tempted to give a full explanation of the system as used in the factory in which he has control of the cost accounting.

EMPLOYEE'S JOB CARD.

No. of Order 1918 D Date, Aug. 24, 1903.

No. 4 Employee, J. Jones Dept. 1

	Quantity Finished.	Hours	Quantity Finished.	Hours	Quantity Finished.	Hours	Quantity Finished.	Hours	Quantity Finished.	Hours
Mon.	90	9	91	7			118	9		
Tues.	117	9	117	9	118	9	117	9		
Wed.	84	6¾	117	9	92	7	117	9		
Thur.	117	9	116	9	117	9	117	9		
Fri.	39	3	46	3½	116	9	118	9		
Sat.			65	5	118	9	117	9		
Total.	447	36¾	552	42½	561	43	704	54		

Remarks:

Quantity finished 2264
No of Hours 176

Foreman, A. King

Employees Must Obtain Job Card from Foreman before Commencing New Job.

THE IRON TRADE REVIEW

FIG. 1.—JOB CARD ORIGINAL IS 4X5 INCHES.

The first important thing about this system, and upon which its success depends, is the fixing of the rate per piece or hundred as the case may be.

The second is the terms of the contract made to the employe, more especially the division of the gains from his increased productiveness under this plan.

they are desirous of fixing a rate to cover the operation. The cost card (original size 5¼ x 8½ inches) shows how the cost of material, labor and factory expense are carried to every operation on each piece until same is completed and a total cost reached. The watching of an employe while at work by the rate-fixer, and making the rate according to what has transpired under his eyes, does not seem to meet with any success, as the price made is invariably larger than it should be. One of the best ways known to the writer, and one which he now suggests, is to issue a day work order with a job card and have the foreman watch the operation thoroughly and report his findings on the back of the job card to the rate-fixing clerk who is then in a position to make a price that is not an experiment. Fig. 3 (original card is 3⅜ x 6 inches) is the report made by the foreman and sent to the rating clerk, who then investigates it by looking up previous costs and if O. K. issues contract covering this memorandum. This is the form the foreman delivers to our rater when he is desirous of putting a job on the premium plan. The rater, after figuring the cost per hundred from this form, then consults the cost department in reference to the record of the previous operations done by the same employes, and if there are any, compares with the records of the same work done by a previous employe.

Second: The condition of the contract calls for a division of 50 percent of the earning power of the man over his allotment to the employe and the same to the employer.

Third: The time allowed him on his contract is from six to twelve months and during that period the employes are allowed to make the most there is in the contract, which usually brings from the men their best efforts towards increasing their productiveness. After the expiration of the

COST CARD.

Part No. O-630

Name of Part.	Operation.
MAIN BAR FRAME.	FINISHING COMPLETE TO PLATER.

MATERIAL.						LABOR.								
Quan. used Lbs	Size	DESCRIPTION.	Cost per Lb.	Amount.	Cost per 100	Operation No.	Date Issued.	Date Completed	Quantity Finished.	Total Cost Labor.	Cost per 100	Factory Expense.	Aggregate per 100	REMARKS.
From	Operation	120	6 A		603	1918 A	5/14	5/20	1519	55.54	3.656	45.99	9.686	To 1st 1920
"	"	120	6 B		6.21	1918 B	6/8	6/20	1313	31.21	2.377	27.00	8.587	" "
"	"	120	6 C		6.02	1918 C	6/22	7/25	3409	76.11	2.233	68.50	8.253	" "
"	"	120	6 D		5.96	1918 D	8/24	9/19	2264	51.35	2.268	51.35	8.228	" "

THE IRON TRADE REVIEW

FIG. 2.—COST CARD. ORIGINAL IS 5¼X8½ INCHES.

The third, an important third too, is the time the contract is to run without change of price, a period which should always be specified when the contract is granted.

First, rate-fixing: All operations about to be classed under the premium system should be closely watched and all records made from previous work on the prospective "premium" operations should be thoroughly investigated. Where the writer is employed we have a job card for each operation (see Fig. 1, original is 4 x 5 inches) upon which the employe records the hours worked on the job and the number of parts produced by him each day. Upon an employe commencing a new job he receives a job card; this job card besides showing time on the job is used so that the foreman may see that the production is up to the requirements of the factory. In other words, suppose the required production is 100 pieces per day. By counting the number of days worked on this job and dividing into the quantity produced you have about 103 pieces per day. When the job runs twenty to thirty days a record is obtained of the cost of producing (labor only).

As we keep a cost card (see Fig. 2) on every operation, and upon which the cost of the operation is recorded, thereby covering a period of over two years, we are probably better off than numerous manufacturers who are now entering into this branch of cost accounting and who are unable to price the contract except by a thorough investigation of the work required on the part about to be operated on, and upon which contract an adjustment of price is made, but only when the profits are abnormal. This adjustment is made in a very broad way by investigating the merits of the operator and circumstances attached to each case. For example, a bright employe whose suggestions for an improvement have been adopted and proved to be a great gain to the company in decreasing costs of his operations would no doubt be met with in a manner entirely satisfactory to both parties concerned. We have found by allowing the contracts to run a specified time and living up to the agreement, that men who were considered fair workmen have developed their talents to good

MEMO. FOR PREMIUM PLAN.

No. of Part O-630 Date June 1, 1903.

Name of Part MAIN BAR FRAME.

Operation 1918. FINISHED COMPLETE TO PLATER.

Employee's Name J. Jones. Hour Rating 21 cts.

Number of parts averaged per day 81 Day Work

Signed A. King. Foreman Dept. No. 1.

THE IRON TRADE REVIEW

FIG. 3.—FOREMAN'S MEMORANDUM TO RATE FIXING DEPARTMENT. THE ORIGINAL CARD IS 3⅜X6 INCHES.

advantage and some are now in responsible positions and are also classed as A1 workmen in their particular class. Men usually let themselves out, as it were, where the profits to themselves are permanent and immediately they show good gains.

Fig. 4 shows the original contract issued, duplicate of which is retained at the office. The duplicate is filed in numerical order and from this the pricing is done to the order when completed. The back of the original contract is left blank, but

No. of Part 0-630 Date June 5, 1903.

PREMIUM PLAN.

Model _____ Readjusted. Present Cost per 100 $ 2.67

Name of Part. MAIN BAR FRAME.

Operation. 1918. FINISH COMPLETE TO PLATER.

Nature of Work. Boring, Tiling, Fitting & Truing From Driller to Plater

This agreement will hold until Sept. 19, 1903.

Based on 81 per 9 hour day and 24 cents per hour.

Number of Parts previously averaged per day

To A. King Foreman Dept. No. 1

Signed, A. Smith, Supt.

THE IRON TRADE REVIEW

FIG. 4.—CONTRACT WITH WORKMEN. ORIGINAL FORM IS 4X6 INCHES.

the office copy reverse is ruled off, as in Fig. 5, to show the record of the operations during the term of contract and is of invaluable assistance in adjusting the price when the contract has expired. The original is sent to the employe.

Fig. 6 shows the factory order issued monthly to the department in which the employe works and to which number his time is charged from his time check to the duplicate of the order shown, as Fig. 7. The back of form seen in Fig. 6 is arranged in six columns as follows:

Parts Delivered to

Date. Quantity. Received by. Date. Quantity. Received by.

In explanation of Fig. 6 John Jones' work is based on 81 parts produced per nine hour day at 24 cents per hour, all

ORIGINAL.

PREMIUM.

Operation No. P 1918 D Date Issued AUG. 24 1903

Dept. No. 1

Part Number	NAME OF PART.
O-630	Main Bar Frame

Operation Finishing Complete to Plater

Office Record

Quantity Finished 2264 @ $ 2.67 Per Hundred $60 45

No.	Employee's Name	Hours	Base	Rate	
4	J. Jones	176	24	24	42 24
	Total Premium				18 21
	Employee's Premium				9 11
	Total Amount of Labor and Profit				
	Paid Hours @				
	" " "				

Actual Cost per 100 2.268 Employee's Profit

Pay Roll Week Ending OCT. 3 1903 21½%

Order Completed SEP. 19 1903 Labor Defective

Amount Finished 2264 Stock "

Date Delivered to Inspector SEP. 19 1903 Total "

Inspected by J. Johnson

Received at Office SEP. 22 1903

Parts completed on this order transferred to Operation No. 1920

FIG. 6.—FACTORY ORDER. ORIGINAL SIZE IS 5¼ X7½ INCHES.

parts produced over this amount he received one-half the value of his labor expended to produce the amount over his allotment. On this order he has produced 2,264 pieces in 176 hours. His allotted time would be 251 5-9 hours, the saving thereby being about 75 5-9 hours at 24 cents, of which amount he receives one-half for his increased production; and although the contract price is 2.67, the actual cost, after giving J. Jones his profit, is 2.268 per hundred, a decrease of .402 per hundred. The larger the profit to the employe, the greater decrease to the company. On the back of the original order (Fig. 6) deliveries are shown of parts produced during the month on order 1918 D and for which we hold the inspection room responsible as to workmanship and quantity being as represented on the factory order.

Quantity Finished	Premium Plan Price per C.	Day Work Price per C.	Employee's Rate.	Employee's Profit.	%
1313	2 67	2 65	24	3 85	14
3409	"	"	"	14 91	24
2078	"	"	"	8 30	21
2264	"	"	"	9 11	22

Actual Cost Per C. 2.271 Entered Sept. 27, 1903.

THE IRON TRADE REVIEW

FIG. 5.—RECORD OF OPERATIONS DURING CONTRACT PERIOD AS ENTERED ON THE REVERSE OF THE OFFICE COPY OF FIG. 4.

As our premium orders are closed monthly the premium is paid accordingly and during the month the employe's wages are paid him each week in the regular way and this amount deducted from his order as shown on this form. If an employe makes a loss, which occurs rarely, there is no deduction from his pay.

When an employe leaves us or is promoted, the new man put on the job is not always rated the same as his predecessor. We then have a base rate and a regular rate and the order is figured as shown in Fig. 8. (The form on which these entries are made is reproduced complete in Fig. 6, and therefore Figs. 8 and 9 merely exhibit such portions as are necessary to show the difference in the completed forms.) An explanation of this condition will no doubt be interesting: Suppose we have an employe rated at 20 cents per hour and who has shown ability to do work of a higher order at an increased rate. We

DUPLICATE.

PREMIUM.

Operation No. P 1918 D Date Issued AUG. 24 1903

Dept. No. 1

Part Number	NAME OF PART.
O-630	Main Bar Frame

Operation Finishing Complete to Plater

Employee J. Jones Rate 2.4

Date	Hours	Amount
Aug 29	36½	8 76
Sept 5	42½	10 20
" 12	43	10 32
" 19	54	12 96
		42 24
	176	

Total by E S

Amount Verified by J. R.

Transferred by E S

Verified by J. R.

FIG. 7.—PREMIUM ORDER DUPLICATE.

put him to work on an operation which calls for a better class of work than he has been used to and if he is unable to meet the requirements of the work involved, he is still able to retain his old position without his rate being changed. This form, Fig. 8, will show how C. Smith came out on this particular job and when this contract expires his rate can be

increased to the rate paid for this class of work, viz., 22 cents per hour.

I will now call attention to a still more interesting condition, See Fig. 9. This form covers what we call "team work." Owing to a peculiar condition on our frame job, where we have men and boys working on operations covering the manufacture of this part complete, we decided that we would create a "team" job, i. e., every man on the job to work under one order and draw from the profit an amount proportionate to his wages earned. You will notice on this order that the profit earned by the team is $67.58. Seven men comprise the team and each man has marked against his name the amount proportionate to his time charged on the job in red ink. It is needless to say that this is a condition seldom met with in manufacturing concerns, yet it has proved a decided success with us, each man working with a vim that surprises the onlooker, a unity existing, due to benefits attained by cooperation, suggestions freely made by the members of the team to the man in charge of the job, and if considered good

Part Number	NAME OF PART
O- 1052	*Back Wheel Gear*

Operation

Drilling and Facing

Office Record

Quantity Finished 12319 @ $ .36 Per Hundred $44 35

No.	Employee's Name	Hours	Base	Rate			
2	C. Smith	138⅝	22	20			30 47
	Total Premium					13	88
	Employee's Premium					6	94
	Total Amount of Labor and Profit					37	41
	Paid 138⅝ Hours @ 20					27	70
	" " "						
	Actual Cost per 100 .304 Employee's Profit 35%						9 71
	Pay Roll Week Ending OCT-3, 1903						

FIG. 8.—PORTION OF FACTORY ORDER AS MODIFIED BY CHANGE IN WORKMAN.

are adopted. Under these conditions an employe falling behind in his work is assisted at once by the odd man, and if the required production is in danger of falling behind, any employe familiar with this class of work may be called upon to help them and he then draws his proportion of the profits according to the time he has worked on the job.

In the writer's opinion the premium system is the only medium between the evils of piece work and day work. It is a partnership between employer and employe, and under the conditions explained above, both realize an equal share of the profits on the work done over the allotment which is a fair day's work per man.

Fig. 10 shows the piece work and premium book in which the orders, after being completed, priced, figured and verified, are entered, thereby giving a record of employes working on this particular job and their profits and percentage of same against their labor and also the actual cost per hundred. This sheet is kept in loose-leaf ledger form and is about 12 x 12 inches.

Fig. 11 shows the report made to the superintendent each month, covering each department, so that he can readily see the profits of the men, combined profits of the department and percentage of profit against the actual labor per department, also combined profits of all departments for the month and percentage shown against total labor of all departments combined. The sheet is 10 x 13 inches.

Piecework and premium orders issued monthly in the plant average about 450.

Cleveland Machinery Market.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 2.

Business shows little, if any, improvement as compared with last month. Many manufacturers are unwilling to be quoted when their own experience has not been such that they can consistently give a favorable report. "We have not a flattering outlook for business," says an officer of one company, "although this month's business has been fair." Another company says: "Business is dull and unsatisfactory." The manager of a large concern describes conditions in this laconic statement: "New business for the past month has been extremely meagre." Other reports are more favorable. For example, the Fraser Machine Works, says: "We have managed to hold our own during the past month and have just received orders that will keep us busy for the next two months with a full set of hands. The prospects for the future were never brighter than at present."

The Reliance Gauge Column Co. finds that business is holding up remarkably well and that present conditions and pros-

Part Number	NAME OF PART.
O- 401	*Carriage Frames*

Operation

Assembling to Varnish

Office Record

Quantity Finished 2531 @ $ 14.76 Per Hundred $373 58

No.	Employee's Name	Prop. of Profit	Hrs.	Base	Rate			
1	A. Jones .1934%	13.07	219⅞	21	21	46	10	
2	B. Jones .1916	12.95	217⅞	21	21	45	68	
3	C. Jones .1390	9.39	221	15	15	33	15	
4	D. Jones .1356	9.16	215⅞	15	15	32	33	
5	E. Jones .1315	8.89	224	14	14	31	36	
6	F. Jones .1125	7.60	223⅞	12	12	26	82	
7	G. Jones .0964	6.52	209	11	11	22	99	238 43
		100	67.58					
	Total Premium							135 15
	Employee's Premium							67 58
	Total Amount of Labor and Profit							
	Paid Hours @							
	" " "							
	Actual Cost per 100 $12.09							
	Employee's Profit 28%							

FIG. 9.—PORTION OF FACTORY ORDER SHOWING APPLICABILITY OF PREMIUM SYSTEM TO TEAM WORK.

pects are quite satisfactory. It has had a good November business and has orders booked which guarantee an equally good showing for December.

A manufacturer of machine tools says: "We hardly like to talk about the conditions of business at the present time. There seems a prospect that there will be more business after the first of the year, but in the past month or two, trade has been very poor in our line. Owing to the fact that we have had a large number of orders on the books, we have not felt the depression perhaps as much as ordinarily, and we hope for better conditions soon."

The C. O. Bartlett & Snow Co. writes: "We are pleased to state that trade is keeping up. We are as busy as can be and are shipping quite a number of orders all the time. Our system of burning coal dust seems to be a success and we believe that we will do a large business along this line. We are fully aware that there has been considerable depreciation in all kinds of iron and steel, and to take an inventory of stuff which was bought several months ago, would show quite a depreciation, in other words, would prove a loss. These things, however, we must expect in business, and this fact causes many manufacturers to go slow."

The Electric Controller & Supply Co. states that it is re-

ceiving even a larger number of small orders than previously; although the large contracts are inclined to hold over until the early spring. The outlook for the coming year appears very encouraging.

The Acme Machinery Co. reports that it has noticed considerable dropping off in business within the last few weeks, although it is fairly busy in the filling of old orders which it has had on its books for some time, as well as a few new orders which have been received recently. The company finds that inquiries for new machinery have within the last few days been more numerous and it hopes that orders will soon materalize.

The National-Acme Mfg. Co. announces that business both as to orders actually booked and prospects for the immediate future are somewhat brighter than they were a month ago. Up to the present time there has been no let-up in its machinery department, and the volume of product orders is again quite satisfactory.

The Cleveland Twist Drill Co. says: "The year past has been in our line of business a very satisfactory one. Of course just at present things are a little dull, but that is always so during the month of November and the few days preceding, owing to the holiday season and to the fact that the hardware jobbing trade are not at this season of the year buying for stock. The general conditions throughout the country appear to us to be somewhat on a decline, and we are not looking for as much business for the next six months as for the past six months. As to prices for our line of goods, there have been no changes for the year, and we see no reason for the falling off in the market price, as the goods have been sold for the last few years at very low prices. No advantage was taken of the boom in the general market to raise the prices in our line of goods, and there is very little room if any for a recession."

The Avery Stamping Co. states that its business has been satisfactory and the indications are that there will be a decided increase during the next 60 or 90 days. The company believes there is a better feeling among the trade, a feeling in fact that the bottom has been reached and that when this fact is generally accepted, business will resume normal conditions.

The Marshall & Huschart Machinery Co. has noticed improvement during the month.

The Macbeth Iron Co. is now rebuilding its foundry and putting in new equipment throughout, including a traveling crane. These changes will more than double the former capacity of the plant and will enable the company to handle anything in the casting line up to 50,000 pounds. It expects to begin casting again Dec. 1.

The Snider-Hughes Co. has sufficient orders on hand to keep it busy for 60 days. For the past 30 days inquiries have not been as numerous as formerly, but the indications are that the company will have sufficient work to keep it busy all winter.

With the Cleveland Stamping & Tool Co. the last two months' business has been very satisfactory and the prospects seem to be good for a continuance of same up to the first of the year.

The Lane Tool Co. is running double turn in order to complete hammers ordered. Business and inquiries are good.

The Standard Welding Co. reports that the demand for staple lines is reasonably regular, although the quantity called for is very much smaller than during any period for the last three years. Collections are very slow at the present time. There has been a gradual tendency in this direction in the last 60 days, but at the present time it is more marked than at any time during the last year. The company is of the opinion that the demand for goods in its line will remain quiet until about the middle of January, when there should be, if the money market is not seriously disturbed, a fairly active demand for the next three or four months.

The Chase Machine & Tool Co. notes a falling off in inquiries, but business still remains very satisfactory, and it says that the business outlook, while promising a quieter time than that of recent years, is not at all gloomy.

The Palmers & DeMooy Foundry Co. states that it cannot report a very satisfactory condition of affairs in its business, the making of light gray iron castings. The demand has dropped off considerably in the past month, and there is little prospect of a better condition until after the first of the year. The orders that are placed are small and for immediate use, and the general policy seems to be to wait until further developments before placing contracts of any size.

The Cleveland Crane & Car Co. reports that business has just about held its own during the last month. The amount of new business in sight is very small, yet the company has hopes that within a very short time construction throughout the country will proceed with sufficient assurance to enable some of its customers to place orders for cranes which they have been holding for the last two or three months.

Controller Grout, of New York City, has approved the sureties of the Pennsylvania Steel Co., in the matter of a contract for the steel superstructure work on the Blackwell's Island bridge. This act puts a quietus on the attempt to hold up the awarding of the contract.

NAME OF PART.

Main Bar Frame No. of Part 0-630

Operation Finish Complete to Plater

	DATE 1903	ORDER NO.	NO.	EMPLOYEE	QUANTITY	PREMIUM PRICE PER 100	PREMIUM AMOUNT	HOURS	EMPLOYEE'S BASE	EMPLOYEE'S RATE	BASE AMOUNT	DAY WORK PAID	PREMIUM TOTAL	PREMIUM EMPLOYEE'S	TOTAL PROFIT	PER CENT	ACTUAL COST PER 100
	10/3	1918	4	J. Jones	2264	2.67	60.45	176	24	24	42.24	42.24	18.21	9.11		21½	2.268

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FIG. 10.—PAGE FROM PIECE WORK AND PREMIUM BOOK. ORIGINAL IS 12X12 INCHES.

PIECE WORK AND PREMIUM PLAN.

for Month of SEPTEMBER, 1903.

EMPLOYEE	ORDER NO.	QUANTITY	PART NAME	OPERATION	PRICE PER 100	AMOUNT	HOURS	BASE RATE	BASE AMOUNT	EMP. RATE	AMOUNT PAID	TOTAL PREM.	EMP'S PREM.	TOTAL PROFIT	%	ACTUAL COST PER 100
				PREMIUM PLAN.												
				DEPT. 1. A. KING.												
J. Jones.	1918 D	2264	Main Bar Frame	Finish complete to Plater	2.67	60.45	176	24	42.24	24	42.24	18.21	9.11		21½	2.268

THE IRON TRADE REVIEW

FIG. 11.—MONTHLY REPORT FROM ACCOUNTING DEPARTMENT TO SUPERINTENDENT. ORIGINAL SHEET IS 10X13 INCHES.

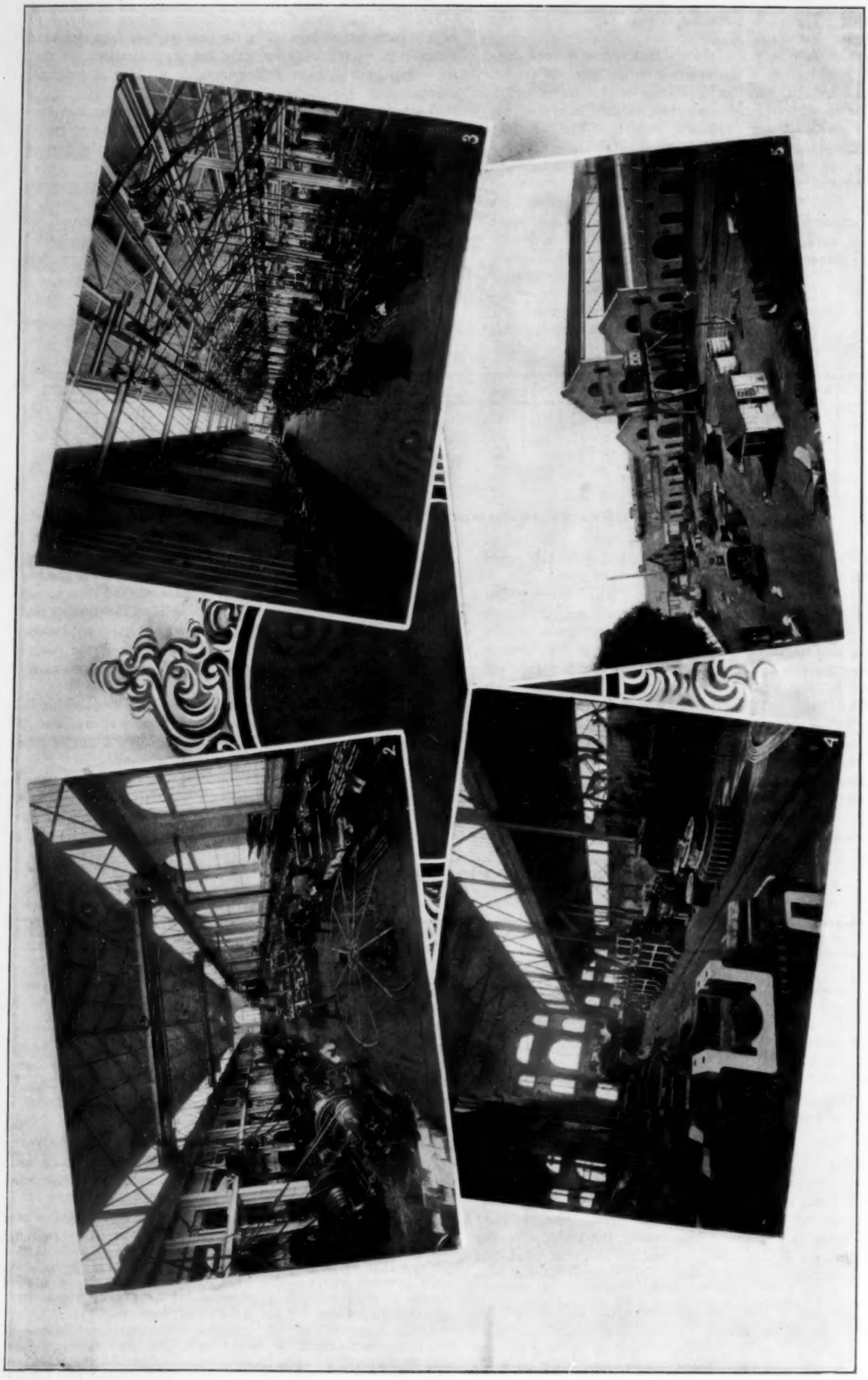


FIG. 2.—NO. 3 MACHINE SHOP.
FIG. 3.—THE GUN FACTORY.
FIG. 4.—MAIN ERECTING SHOP FOR HEAVY MACHINE CONSTRUCTION.
FIG. 5.—THE SHIPPING YARD.

The Works of the Société John Cockerill, at Seraing, Belgium.

BY EMILE GUARINI.

Of all the industries established in Belgium, the machinery trade has had the greatest development and its products are those most appreciated in distant countries. This reputation is in great part due to the activity of the Cockerill plants, which hold a place apart, both on account of their material importance and of their diversity of occupations, employment being given to some 11,000 workmen. If it can be said that the Cockerill works equal those of Krupp in their gigantic proportions, it is also true that they surpass the latter in various characteristics not to be found in the Essen plant. The Seraing works include, as a matter of fact, all branches of mechanical engineering and are not restricted to the making of cannon. It is the most complete collection possible under the one management in a single plant and combines coal and iron industries with the building of machinery.

Features of Machine and Erecting Shops.

The machine shops are among the most interesting parts of this very interesting whole, as seen in the general view at Fig. 1. Work shop No. 1 is 395 by 148 feet and is devoted to the finishing of the parts turned out in the rough by the molders and smiths. The equipment is everywhere of the most modern type and is arranged in groups of similar tools. Lathes, for example, are placed together on one side of the shop and the planing and slotting machines are arranged in separate combinations. The collection of drilling machines is especially interesting. These tools of comparatively modern invention are adapted of every form and so dispense in great measure with hand work. The power saws are highly effective tools and the shop has two traveling cranes of a capacity of 4,000 pounds respectively. An adjacent building is occupied by a cock and valve factory and another neighboring structure has the polishing department with its rows of emery charged buff wheels. The toolmakers' department is in a separate but conveniently located building and here standards are made for working limits to within .004. A series of precision tools is continually busy making gauges, models and tools of exact shape and close dimensions to control the manufacture in the shops. There one may see lathes with an elliptical movement for backing off the screw threads of taps and so-called "rectifying machines." These finish up the steel tools which are often badly misshapen in the tempering process. Some special machines for automatically cutting the teeth in spur, bevel gears and worm wheels are deserving of mention.

Shop No. 3, Fig. 2, is one of the oldest and was completely modernized in 1900. It is devoted to the fitting of machines or apparatus of moderate size, such as stationary and marine engines, pumps, traveling cranes, etc. In this shop also are the special machines for finishing locomotive axles. The main portion of the shop is 328 by 52 feet and is equipped with an electric crane of 40 tons capacity and two traveling cranes of 5 tons each. The manufacture of rapid fire guns formerly carried on in this department now takes place in a nearby building, together with that of cannon of large caliber. The new workshop, Fig. 3, has an area of 32,290 square feet and contains among other things some lathes capable of finishing work up to 49 feet long, two ponderous machines for boring gun barrels and a rifling machine for cannon which will work up to bores of 9½ inches diameter. The moving of the loads is effected by means of three electric cranes, the largest having a capacity of 27 tons.

FIG. 1.—FACTORIES OF THE SOCIÉTÉ JOHN COCKERILL AT SERAING, BELGIUM.

The erecting room of the locomotive shop is served by means of electric traveling cranes of 40 tons capacity, permitting every facility in the handling of heavy work. The shop has a productive capacity of 100 locomotives per year. Most of these are of light pattern with vertical boilers for factory service, special tracks, etc., and these constitute, by the way, a specialty of the establishment. The greater part of the locomotives in Belgium and a great many of those in use throughout France, Italy, the Dutch Indies, Spain, Russia, Turkey, South America and in Germany, came from the Cockerill shops. This workshop is supplemented by another for the light smith work, comprising the casings, piping, the fitting of tenders, etc.

The principal erecting department, Fig. 4, is reserved for the construction of the largest machines and is a building divided into three portions, the middle one being 65 feet from floor to the meeting point of roof and walls. The side bays contain the most powerful machine tools. The hoisting apparatus includes a crane of 40 tons capacity which traverses the central portion of the building from end to end and is 50 feet from the ground. A second electric crane, for loads of 5 tons only, makes the trip upon the same rails.

Each of the bays is equipped with two electric traveling cranes, one of which has three motors for lifting loads of 25 tons, while the other with a single motor can handle loads up to 5 tons. This apparatus facilitates the setting upon the lathes, boring machines, etc., of the massive pieces which come in from the forge shop and the foundry to be finished there. Among the machine tools is a slotter which is at the same time serviceable as a vertical planer, having a stroke of 5 feet and a movable head, allowing of the working of material as much as 6½ feet high. The largest of the lathes is capable of swinging a diameter of 46 feet and is employed in the turning of flywheels, grooved pulleys or other parts of large dimensions. One large lathe was made especially for turning the plungers of the great hydraulic presses for the elevator of the canal of the Centre de la Lonoiere. These plungers were 6½ feet in diameter. The largest of the boring machines will work on cylinders up to 9½ feet in diameter.

A machine shop has practically been set up on a massive cast iron floor presenting a perfectly straight surface of 1,600 square feet. Large castings may be placed on the plate and machined by two drills which are independent of each other and may be installed at a maximum distance of 23½ feet apart or used conjointly. The floor plate is also adapted to receive a separate outfit of boring and milling machines for the purpose of working at several points at a time and with the requisite precision in machining pieces of large dimensions and complicated forms.

At the front of the building is a spacious yard, partially shown in Fig. 5, traversed in every direction by tracks. An electric crane of the Goliath type and of 40 tons capacity serves for the loading and unloading of cars which carry to their destination the finished machines or bring the various rough parts to the factory. A 500-ton hydraulic press serves for the assembling of cranks and the placing of flywheel hubs on shafts.

The buildings of this division comprise also a special factory for bolts, nuts, rivets, etc., and there are numerous applications of screw machines to the work of trimming and threading stock. There are paint and varnish shops, forge shop with tool tempering equipment, a packing house, store houses—one of these, a most important one, for patterns—and other buildings of a like character.

Heavy Forging Presses.

As an object of primary interest, the smith shop at the Cockerill plant exhibits an enormous forging press. Forging by hydraulic pressure, in which one sees the masses of incandescent metal kneaded like clay and without shock, noise or apparent effort, presents a striking contrast to the old-fashioned working with a hammer. In working steel the use of the press exhibits an incontestable superiority. Steel suffers from the sharp blows of the hammer which sometimes produce molecular disintegration. The hammer holds its own, however, for forging iron. The hydraulic press in question has a maximum power of 2,000 tons and suffices for the production of the largest forgings required. The transportation of the ingots from furnace to press is accomplished by a traveling crane capable of lifting a load of 70 tons. The old equipment consists of a set of ten hammers, some single and others double acting. The most powerful weighs 30 tons and has a drop of 9½ feet.

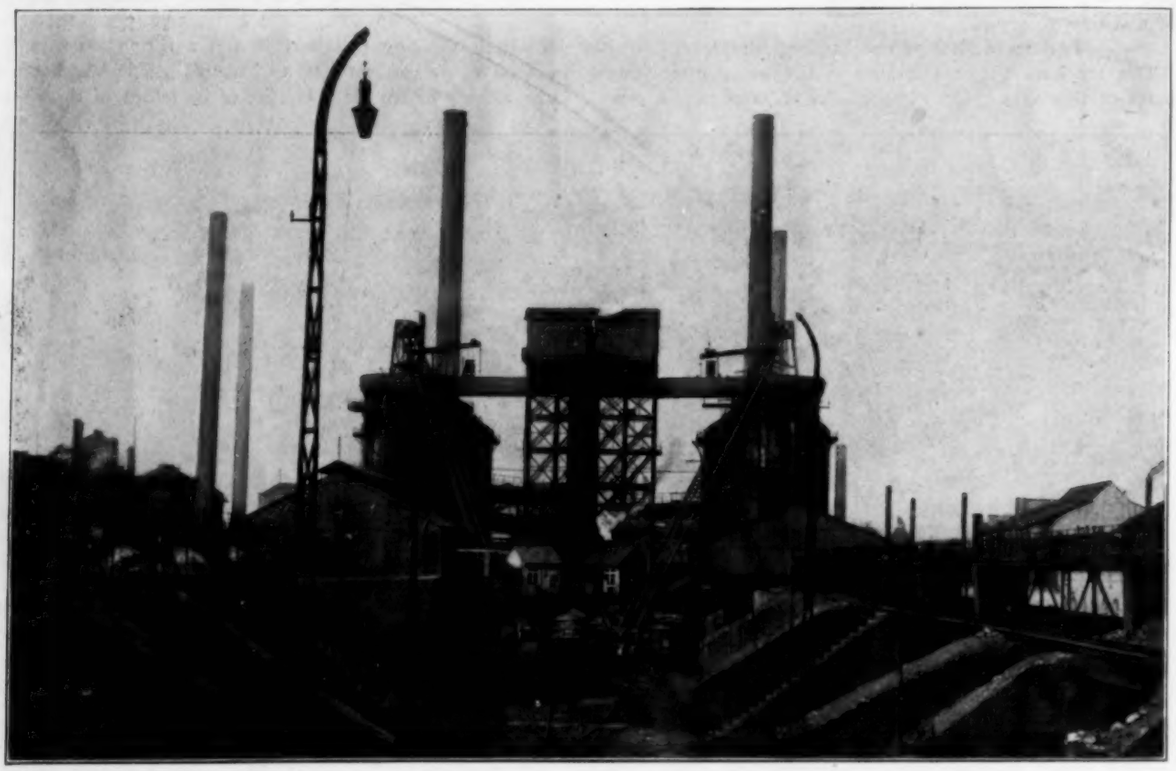


FIG. 6.—BLAST FURNACES 5 AND 6.

Tempering with oil is the method in use for all gun barrels and sleeves, to which it gives elasticity. The oil reservoir has a capacity of 5,280 gallons.

In the smith shops are made the apparatus pertaining to steam generators, reservoirs, converters, etc., and those relating to bridge and structural work. There are two divisions of this department; the first is fitted up for bending and forming sheets, hot and cold forging of iron, steel or copper plates. There is an equipment of sets of rolls with every adjustment for the accurate production of sheets with the desired radii. Forming the bottoms and fronts of boilers, tanks, etc., is performed by means of a series of hydraulic apparatus. A part of the work is carried on outdoors. This is particularly the case with large marine boilers, as illustrated in Fig. 7.

The erecting room of the smith shop with its cranes and batteries of punching and boring machinery, slitting and riveting machines, is one of the largest in existence (172,160 square feet) and will soon be increased by six rooms, varying from 42 to 48 feet wide and 25½ feet long.

The foundry is almost wholly given up to the production of soft steel castings, by the Siemens-Martin process. There are two furnaces of 20 tons each for this purpose and they use either Bessemer or Thomas steel furnished by the steel works of the company. The rolling department is provided with roughing tools—two large and two small—a rolling mill for medium sized sheets, a mill for slabs and another for large sheets, this last being capable of handling 5-ton ingots and driven by a horizontal reversing engine of 1,000-horsepower. This engine is illustrated in Fig. 8. The other mills are operated by vertical, condensing engines, having variable expansion valve gear.

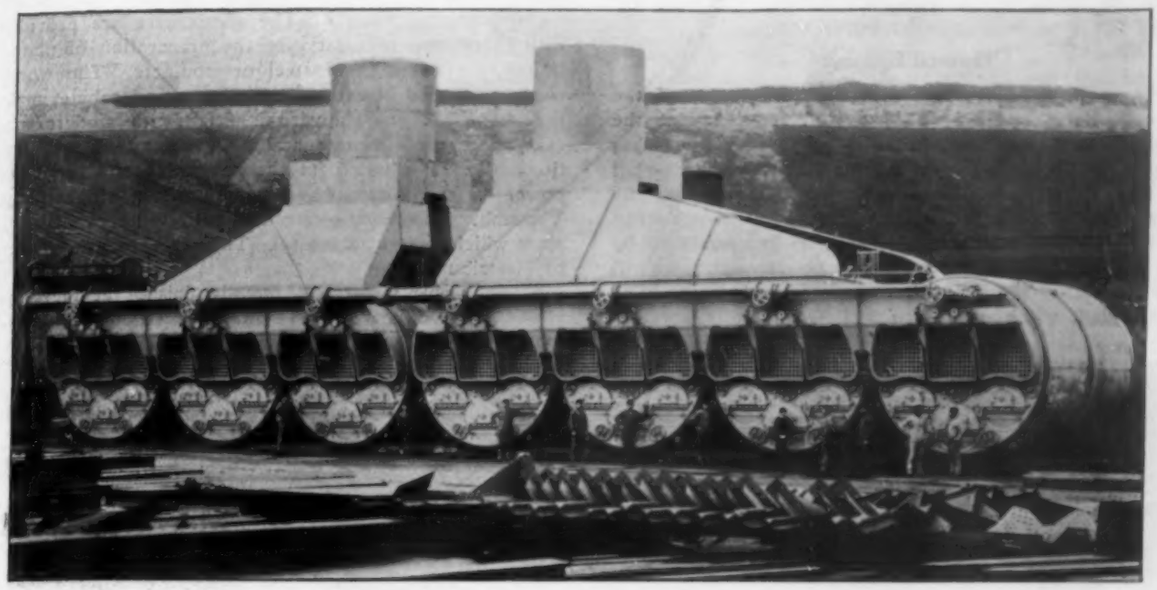


FIG. 7.—MARINE BOILERS IN THE OUT-DOOR ERECTING DEPARTMENT.

Blast Furnaces and Steel Works.

The six blast furnaces mark distinct epochs. The oldest are 60 feet high and produce 80 to 100 tons in the 24 hours. They are arranged for supplying hot metal to the converters of the steel works. The blast furnaces numbered 5 and 6 and shown in Fig. 6 are of more modern type and are fed in a simple manner. The tracks bring the cars laden with coke, ore, etc., direct to the foot of the furnace. There the transfer is made into skips which the hoisting machinery of the Brown system raises to the mouth of the furnace.

The air blast system is installed with a completeness rarely met with. The blowing engines are nine in number, six operated by steam and the others by the gas from the blast furnaces. One of these gas engines is illustrated in Fig. 9. The steam for the blowing engines and other motors of the blast furnace division is supplied by boilers heated exclusively by the waste gases from the blast furnaces. The direct use of the gas from the blast furnace for engines is being generally adopted. The most direct utilization of this process is shown in the blowing engines of the blast furnaces. The first gas engine of 600 effective horsepower has been in service since 1899. From that date engines of this type have been furnished in great number from 600 to 1,200 horsepower to operate dynamos, etc. One is being constructed for the St. Louis Exposition which will be the largest built. The fitting up of this unit of 6,000 horsepower would seem to mark the limit so far contemplated in this industry.

The slag and clinker are employed for the manufacture of brick and cement. Steel is made at Seraing, as already stated, by the Martin and Bessemer processes. Martin furnaces and Bessemer converters are installed side by side and supplement one another, the first using a great part of the waste of the other. The five converters can produce 800 tons of steel ingots daily. They are fed from a mixer where the metal from the furnaces is received in batches of about ten tons. The blast is supplied by two compound, vertical engines of 600 horsepower. The three Siemens-Martin furnaces can each receive 15 tons and jointly produce an ingot of 45 tons.

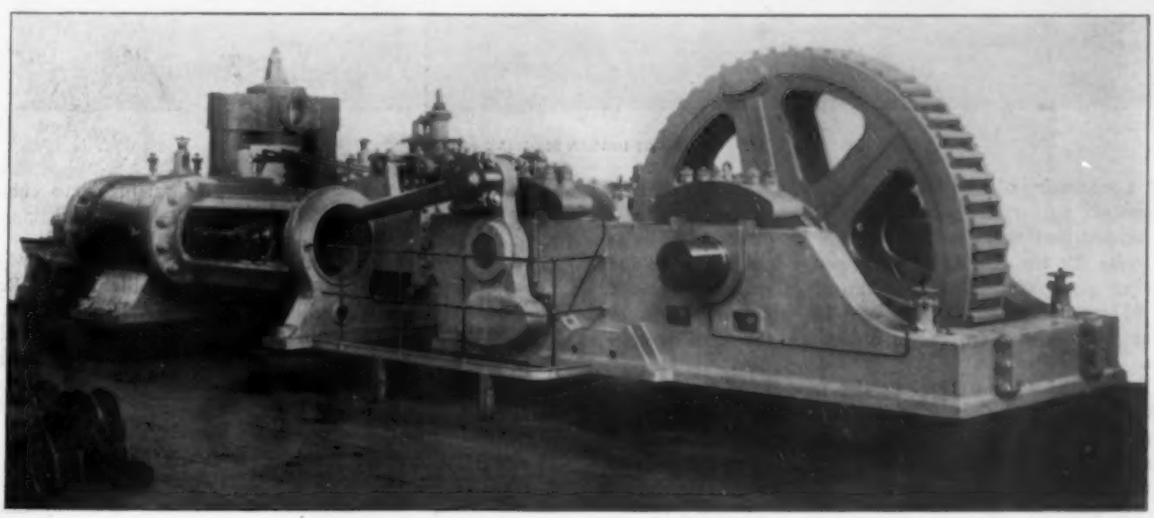


FIG. 8.—THE BLOOMING MILL REVERSING ENGINE.

The Siemens-Martin steel is used exclusively for boiler plates, gun barrels and hoops, locomotive tires and axles, etc. The process followed at Seraing consists in melting on an acid or basic lining a mixture of iron and scrap, the latter being chiefly the scrap Bessemer stock.

A special section situated back of the main works is fitted for the manufacture of locomotive wheels and axles. Such wheels are exclusively of cast steel. There is also a department for stamping sheet metal into cases used as munitions of war—shell bodies, cartridges for rapid fire guns, fuses, powder boxes, etc.

Electrical Equipment.

We shall not elaborate upon the exploitation of the various forms of the coal and iron industries at the Cockerill works, nor on the coking plant which furnishes yearly 150,000 tons of coke; but we shall say a few words on the lighting system, the conveyance of power, and the ship yard. The works actually use electrical energy up to 3,300 horsepower; of which total 1,800 are produced by the engines (of the Marre-Debouteeville and Cockerill type) utilizing the gases from the blast furnaces. The steam plant will soon be replaced by electric generators with a gas engine of 1,500 horsepower, this machine being now in process of construction.

The distribution of power is made by direct current at 250 volts for the conveyance of energy and 125 volts for lighting purposes. Two generators of 200 horsepower are operated by gas engines and by means of a three-phase system operate the grinders of the cement factory.

The central station receives the gas directly from the blast furnaces. It passes into a Theisen washer which uses centrifugal force and the injection of water to eliminate the dust borne by the gas. This scrubbing is carried far enough to insure regular and continuous operation of the gas engines, the latter being shut down for a period of only two hours each week. The outdoor electric wiring to the buildings is by overhead cables, but elsewhere is laid in conduits. The net cost of the lighting, thanks to the use of gas from the blast furnaces, is exceedingly slight.

Other applications of electricity are numerous. All the 47 cranes are electrically equipped; almost all the transmission apparatus of the factories, the centrifugal pumps, the crushers, the ventilating system, are operated by motors. Some of these attain to the size of 250 horsepower. The total number of electric motors is in excess of 150. The lighting system comprises 5,000 incandescent lamps and there are 550 arc lights.

Shipyard.

The shipyard is situated at Hoboken, Anvers, and covers some 15 acres with a river frontage of 684 feet. There are four slips for craft of all kinds and of any tonnage; a dry dock 400 feet long and closed by pontoon gates; a derrick with capacity for installing boilers and engines in hulls. There is a basin and two wharves for the finishing of vessels. The shops here are provided with everything necessary for the preparation of plates, frames, forged parts of steel or iron, etc. The woodwork is handled in extensive carpenter and cabinet making shops and the shipyard is fitted with modern machinery on an elaborate scale. A central electric station has been installed for the generation and supply of power to the different machines used in shipbuilding. The smith shops have received an entirely new ventilating plant which is very successful. The ventilators are driven by electric motors.

A remarkable vessel was recently finished at the shipyard. This is the "Bates" hydraulic suction dredge and has a capacity on a sandy bottom of raising 4,000 cubic yards per hour and depositing the material at a distance of over 650 feet.

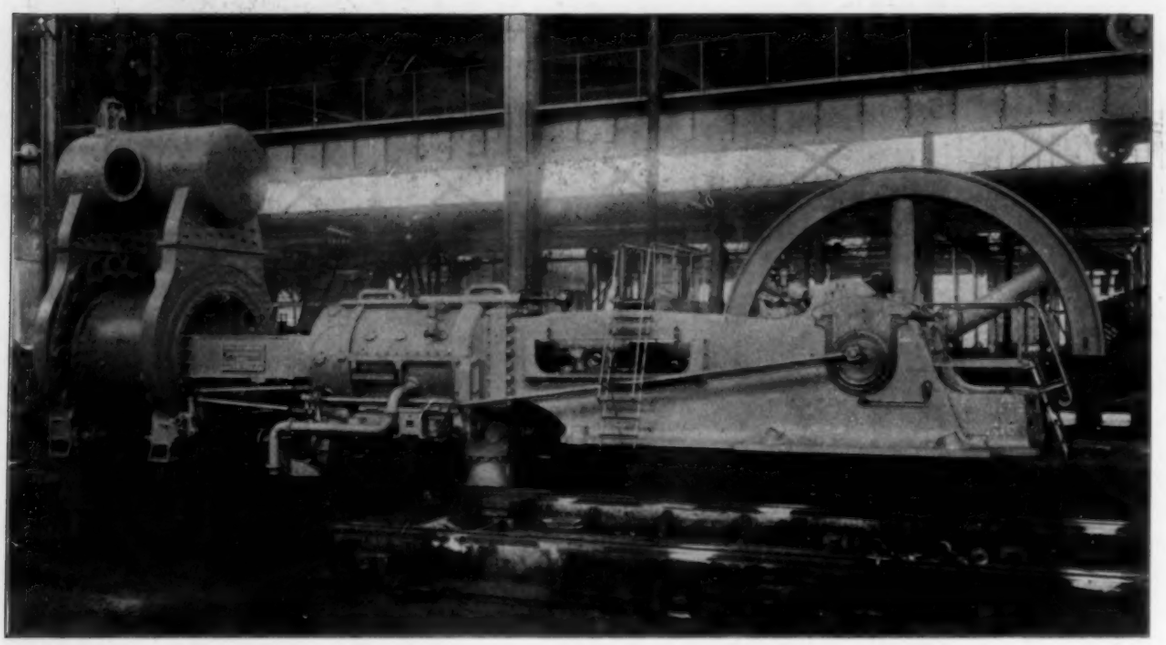


FIG. 9.—A GAS DRIVEN BLOWING ENGINE.

W. L. Simonton, manager of rolling mills of the Republic Iron & Steel Co., has written to the president of the Merchants' Association, of Ironton, O., that the Eagle mill of the company at Ironton is not for sale. In his letter, Mr. Simonton says: "We would not entertain a proposition to sell it, for the good reason that when business will justify it, we will again operate the plant."

The foundry of the Southern Car & Foundry Co., at Gadsen, Ala., has been placed in operation, to supply castings for the same company at its Anniston plant, which was already in operation on an order for cars. The starting of the foundry department made the company's operations complete.

The Continental Coal Co., Columbus, O., is installing a 400-h. p. engine, purchased from the Ball Engine Co., Erie, Pa., and has ordered a duplicate engine from the same company.

The soil pipe plant of the Central Foundry Co., at Anniston, Ala., which had been idle for some time, has resumed.

NEW MACHINES FOR MULTIPLE DRILLING.

The ingenuity of the designs developed by the National Automatic Tool Co., of Dayton, O., has received attention on several occasions in the columns of *The Iron Trade Review*. Additional examples of drilling machine design are now presented. The first, Fig. 1, is a special tool for sewing machine manufacturers, completing the drilling, reaming, facing and counter-boring of all the holes in the arm without removing the piece from the jig or in any way handling the jig itself. The work is enclosed in a box jig which forms the platen itself; this jig platen revolves, thus presenting in turn every portion of the arm to the drills in the turret. The machine drills from the front, back and right side simultaneously to reach any point on the arm. The horizontal drills are actuated by chains and sprockets and the rotating jig is raised and lowered, either automatically or at the will of the operator, so that the machine may be instantly stopped, the jig lowered and the work removed at any stage of the operation. The long spindles on the right are for rough drilling the shaft holes in each end of the arm. These spindles are provided with a bearing of eighteen inches to insure the greatest degree of accuracy practicable. Each drill is provided with a slip bushing which is automatically carried into the bushing in the jig and withdrawn after the hole is completed. After the holes have been rough drilled, the jig revolves and a combination reaming and facing tool in the turret head completes the operation.

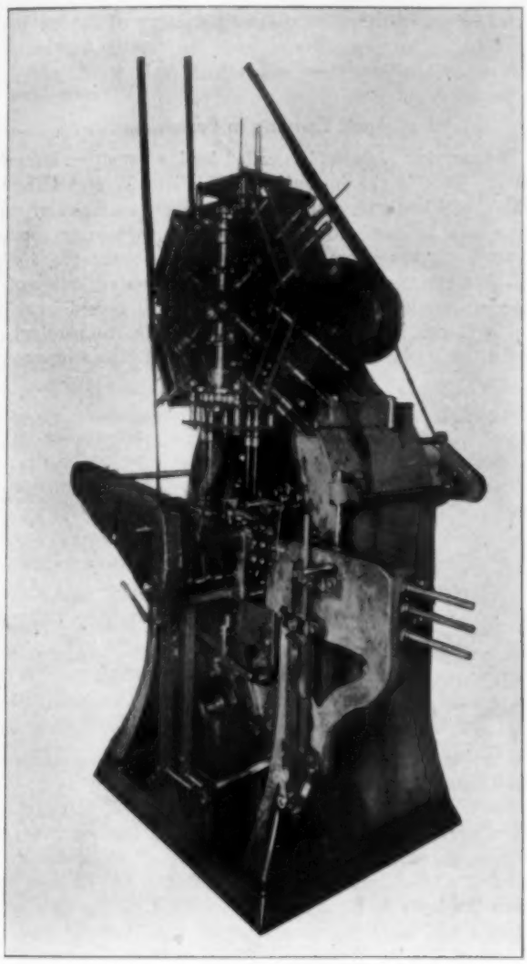


FIG. 1.—AUTOMATIC MULTIPLE SPINDLE DRILLING MACHINE.

Fig. 2 is another novelty in multiple drilling. This machine was designed to meet the demand for a drill press of smaller capacity than the turret drill. It retains most of the important features of the turret machine but has only two clusters of drills instead of six. From four to ten spindles may be used in each cluster, and each spindle is adjustable in any direction. The drill is made in two sizes, one to take drills from No. 60 wire gauge to 3/8-inch and the larger one from No. 60 wire gauge to 3/4-inch. The idea of the double cluster is that one set of drills will drill and the other set may be used to ream or counterbore the same holes, or where two holes are to be drilled in close proximity one hole is drilled with the first cluster and the next one with the second cluster. The feed table, or platen, revolves automatically, and may be indexed from two to six times. From three to six jigs may be mounted on the platen, and the operator standing in front of the machine simply loads and unloads the jigs as the platen revolves. The operation is continuous, two jigs being worked on while the others are being loaded.

On this machine the drills are automatically depressed to meet the work after each indexing of the platen. The machine may be stopped instantly, in any position, at the will of the operator. The spindles are all gear driven, and each drill runs at its own proper cutting speed. There are three changes of feeding speed for the drills and different jobs may be carried on at the same time, or two or more pieces may be mounted in the same drill jig and drilled at once.

FIG. 2.—ROTARY PLATEN AUTOMATIC MULTIPLE DRILL.

The Monmouthshire (Eng.) Steel & Tin Plate Co., employing 1,000 men, announces that, owing to the importing of German and American steel in Great Britain, the profitable continuation of its business is improbable. It has notified its employes that hereafter they will be engaged under weekly instead of monthly contracts. The company has spent £40,000 during the last five years in modernizing its plant.

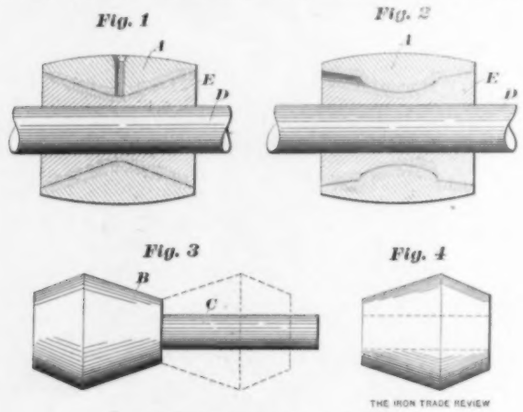
J. W. McQueen, recently appointed receiver for the Jenifer Furnace Co., Jenifer, Ala., will have the furnace blown out, and kept out of operation until the affairs of the company have been straightened out.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

The Finishing of Bearings.

A journal bearing is the subject of a recent patent by P. T. J. Monson and Oliver H. Smith, of Springfield, O., which suggests how wide a range stretches between the various branches of the machine business. The manner in which the makers of machine tools produce hardened surfaces is fairly well known and need not now be discussed but in the invention under consideration the method is as entirely different as may well be imagined. Of course the whole distinction rests upon the question of finish, the character of surface and quality of material, and these are governed by the peculiar purpose for which the bearing is intended. The principal thought of the inventors was the production of an inexpensive bearing for agricultural service, the hubs of discs for instance, in the construction of harrows, wheels for barrows, etc. This as will be readily seen demands a totally different treatment to numerous other bearing requirements.

The journal bearing consists of two parts of such a form that when cast together they will have hardened bearing surfaces with proper clearance for operating one within the other and avoiding the use of stop collars. The other part maybe constitutes the hub of a pulley or a stationary box or any similar mechanical device and the inner part may be cored out to form an opening for an axle, bolt, trunnion or shaft as the



A FOUNDRY FINISHED BEARING.

case requires. The support can be placed within the outer part of the bearing and the metal to form the inner portion is then poured, the metal shrinking on the support and forming on the outer surface a hardened bearing, the outer portion being of such a shape that the shrinkage lengthwise will compensate for the shrinkage in diameter and give a proper clearance.

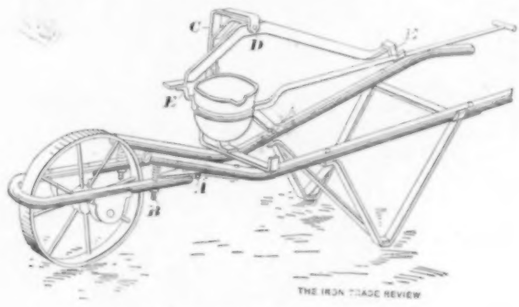
Fig. 3 is a sectional view of the device placed upon a shaft. Fig. 2 is a sectional view showing a modified form of the bearing surfaces. Figs. 3 and 4 illustrate the chill used in casting the outer part of the bearing. The bearing box A is first cast in a sand mold in the usual way, the interior being formed to the desired shape by the chill seen in Figs. 3 and 4. The chill shown in Figs. 3 and 4 is suitable for the bearing A, illustrated in Fig. 1. This metal core is made in two parts, the part B being attached to the shaft C, and the half shown in Fig. 4 is bored to fit and slips on the shaft to the position illustrated by the dotted lines in Fig. 3, when the chill is placed in the mold and the casting made. Afterwards the two ends of the core are driven out of the casting.

The outer portion has now been made and the shaft D to which the bearing is to be attached is placed within the casting, the open ends around the shaft are closed leaving an opening through which the metal is poured to form the part E. The metal will conform to the inner surface of the outer bearing and being chilled by it will also produce a hardened bearing surface. The shrinkage will be toward the inclination of the part E and will compensate for the shrinkage in diameter and this in turn grips the shaft. A sand or any other core can be substituted for the shaft and the bearing fastened in place subsequently by bolts or similar means. The included angle selected by the inventors in their work ranges from 70 to 75 degrees, but the choice is largely a matter of experiment dependent upon the purpose and design of the bearing.

Fig. 1 shows the bearing surfaces inclined in straight lines but it will be evident that the form may undergo considerable variation and yet have the longitudinal shrinkage compensate for the shrinkage in diameter. Fig. 2 illustrates the bearing with a raised portion at the middle. The oil holes will be located according to the vertical or horizontal position of the bearing. The inventors states that they have found from experience that the centrifugal force by reason of the inclination given to the bearing surface, tends to free the bearing from dust or grit—a statement which will apply with equal force to the lubricant.

Ladle Carrying in Foundries.

The carrying of ladles has called forth a patent on a foundry truck. This is the invention of William F. and Oliver E. Mains, of Cleveland, and is "to obviate the necessity of carrying a ladle by hand from one part of the foundry to another." There are other improvements suggested in the truck which will interest many past and present carriers of ladles of the type in question. The ladle hangs from a poised beam and will preserve its equilibrium despite the hasty manipulation of the truck when molders and metal are at high temperatures,



CONVENIENCE IN POURING.

the spring frame will, it is expected, avoid the spilling of metal when the truck passes over rough ground.

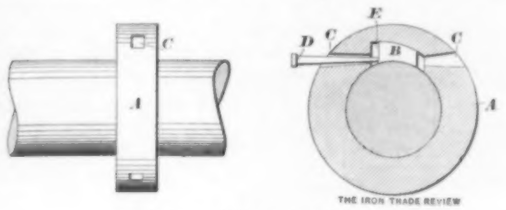
The wheel frame as shown, is made of tubing looped around the wheel and hinged at A to the handle frames. This connection permits a relative movement of wheel frame and handles, a movement which is cushioned by springs coiled about the bolts at B. These bolts extend loosely through the handles and wheel frame and allow some vertical play. An overhanging post C is supported on the handle bars and carries a poised beam suspended by a pivot at D. There are hooks E at the ends of the beam and from these the ladle is swung. One of the hooks engages an eye on the ladle and the other engages the shank of the ladle handle. The supporting post overhangs the center line of the truck, and the beam, hooks and post form a gimbal connection to maintain the ladle in a level position. The pivotal connection avoids the spilling of metal from the tilt of the truck and the cushioned frame takes up the vibration due to the unevenness of the path.

Set Screw Elimination.

Convenient as the setscrew comes in many corners of machine manufacture, there are some purposes for which the device is held to be a necessary evil. The use of setscrews of the head projecting type is decidedly objectionable on line shafts and many very serious accidents have taken place from causes of that class. The invention of Ole Rudd of Duluth, Minn., endeavors to fill the long felt want by proposing a stop collar without setscrews of any kind whatever. Blind screws

are often employed on small collars and for that purpose the screwdriver slot is all sufficient; the use of a socket screw has been tried on larger collars with some degree of success, but these in the nature of things are dependent upon screw conditions and peculiarities. The inventor of the contrivance under consideration does not dodge the issue by any attempt to improve the screw save only as it is capable of improvement out of existence. He proposes a collar which can be secured on a shaft by means lying wholly within the collar and offering no projection at any point and which may also be easily removed without injury to its parts. One would suppose that such a contrivance would depend upon a key and so it does, but it is an uncommonly contrived fastening. This key fastening is not driven lengthwise of the shaft for instance and in that respect differs from the majority.

The illustration represents an edge view of a collar embody-



THE CURTAILMENT OF SETSCREWS.

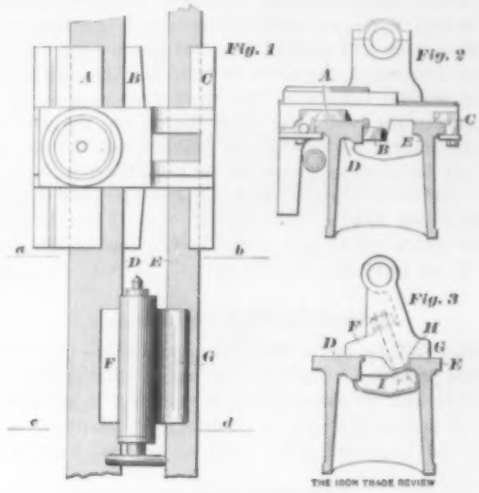
ing the invention and applied to a shaft. The view to the right shows a transverse section through the shaft, collar and wedge. The collar A is fastened upon the shaft by the key B, this key being grooved at the lower edge abutting on the surface of the shaft. The key B lies in a groove in the inner face of the collar A, the groove E having at one end a depth equal to the greatest depth of the wedge and from that end tapering to the opposite end so that when the wedge is forced toward the shallow end it projects slightly from the groove and the teeth of the key engage the shaft. Openings C are made in the collar and communicate with the deep as well as the shallow end of the groove E and a drift D is applied to drive the key into engagement with the shaft. Obviously the drift can be introduced from the opposite end to loosen the key and the collar.

Lathe Improvement in England.

The designs made by James Brockie of London, for machine tool construction have already received attention in the columns of *The Iron Trade Review* and more recent developments may be of general interest. The latest of his attempts along the line indicated is described by the *Mechanical Engineer* somewhat as follows:

Fig. 1 is a plan view of the bed of a lathe fitted with the new slide rest and tailstock; Fig. 2 is a transverse vertical section taken on the line a-b of Fig. 1 to show the slide rest and its carrying and guiding slippers, and Fig. 3 is a vertical section on the line c-d of Fig. 1 showing the construction and arrangement of the tailstock. On the slide rest there are fixed three slippers, A, B and C. Two of these, A, B, are located near the front of the slide rest, and bear upon the rail D of the bed to support and direct the front part of the slide rest, while the third slipper, C, bears upon the rail E of the bed to support the rear slide rest. The two slippers A, C, of the slide rest are located, much as usual, at each end of the cross slide, but they differ in that the front slipper A is adapted to fit and cover a portion only of the top of the rail D, and extends downwards upon the front of the rail also, while the rear slipper C fits upon and covers a portion only of the top of the rail E to support the slide, but does not bear against the back vertical edge of the rail E, and so the rail C does not act in any way to give longitudinal direction to the motion of the slide. This duty of keeping the slide rest as it slides along by the operation of the lead screw parallel to the axis of the lathe is imposed entirely upon the third or extra slipper B, which is fixed to the under side of the slide rest, so that its forward face bears against the inner vertical face of the front rail D, and in this manner the guide rail D is enclosed, as it were, between the two slippers A and B, excepting that part of the top surface of the rail which is exposed and free to accommodate one of the feet of the tailstock.

The tailstock, referring to Figs. 1 and 3, has a relatively wide base, and is formed with a front foot F which rests upon that part of the rail D which is not occupied by the slipper A of the slide rest, while the opposite foot G of the tailstock rests upon the top surface of the rail E which is not occupied by the slipper C. The tailstock is further provided with a guide rib H which bears against the rear rail E, and forms a guiding surface for the tailstock when it is clamped in position. In order that the rib of the tailstock shall be firmly drawn to and held against the guiding edge of the rail E, while the feet F and G shall also be firmly held upon those flat upper surfaces



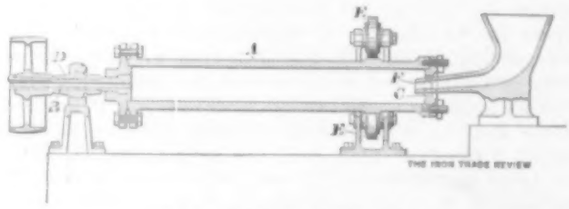
MENDING THE WAYS OF THE LATHE.

of the rails D and E there is provided beneath the tailstock, and normally bearing beneath the lower edges of the rails D and E a locking plate I, which is engaged by the head of a bolt which passes angularly through the base of the tailstock. By tightening the nut the locking plate will be brought up beneath and against the rails D and E, the tailstock will be held down upon the rails and the rib H will in addition be held in firm contact with the guiding edge of the rail E. By this construction a tunnel is formed through which the extended slipper B may pass when the slide rest is brought up against the tailstock or *vice versa*.

The Casting of Hollow Ingots.

An apparatus devised by Paul de Hemptinne, of Ghent, Belgium, relates to the casting of hollow ingots of steel or other metals. The inventor admits that attempts have been made by others to cast such ingots by the use of a hollow mold, but so far as he is aware, such efforts have not been successful. He is of the belief that the previous failures have been largely if not entirely due to the rapid cooling of the molten metal before a proper distribution has been made in the mold as well as to vibrations or variations in the speed of rotation.

The illustration is a sectional view taken along the axis of



HOLLOW INGOT MANUFACTURE.

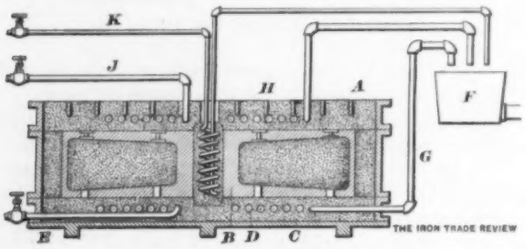
the mold proposed. There is a tube A having at one end a cap carrying a hollow shaft B and having at the other end a cap with a central opening C for the admission of metal. The caps are fastened to the tube A in such a manner as to permit removal when the ingot is cast, as well as to allow a choice of caps with different openings C and for the use of different molds with the same caps. The shaft B is mounted in a bearing which will permit slight changes in the direction of the axis of the mold without interfering with the adjustment of the bearing or bind the working parts which would probably result in variations in the speed. The shaft carries a bearing

sleeve D in a block, the bearing surfaces being the form of the central zone of a sphere, and a driving pulley is also placed on B. The mold is supported by a bearing which engages the tube near the entrance and is capable of automatic expansion and contraction to meet the changes due to the heating and cooling of the mold. This is a roller bearing comprising the rolls E arranged in a triangle and one at least held in place under a yielding pressure. The other two rolls support the mold and the adjustable roll is under the tension of a spring.

The molten metal is introduced into the mold through a nozzle F, which projects into the opening C, extending some distance within the inner face of the cap. The nozzle F is slightly inclined and tapered and connects with a hopper or chamber into which the metal is poured. The opening C is to be of suitable relation to the nozzle F to leave an air passage between the two. The air is drawn into the mold with the metal and escapes through the hollow shaft, the movement of the air being of assistance in the rapid distribution of the metal. The mold is first rotated at a speed of from 600 to 750 revolutions per minute. The molten metal is then introduced into the mold through the nozzle and is thrown against the sides of the mold and, it is hoped, will advance in a spiral path.

Uniform Shrinkage in Castings.

William A. Bole, of the Westinghouse Machine Co., of Pittsburg, has presented a plan for ensuring an absence of many of the cooling and shrinkage strains in castings. In making castings with unequal thicknesses of metal, particularly if the castings are of large size, some portions will cool more rapidly



A CHECK ON STRAINED CASTINGS.

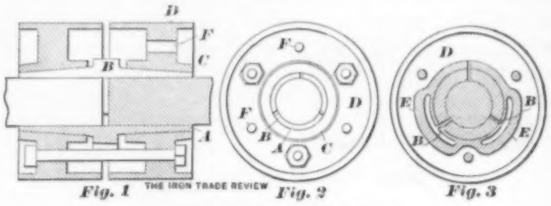
than others, and the thicker and heavier sections continue to contract after the thinner sections have assumed their final dimensions. Strains are thus produced in the castings which are sometimes so serious as to cause rupture, even while in the mold, and sometimes giving no visible sign of their existence until the skin of the castings is removed by machining, when the internal stresses produce a rupture of the casting. Cases have been known in which the rupture due to internal strains took place months after the castings were made and without any previous indication of the existence of these strains.

The illustration is that of a vertical section through a sand mold provided with means for producing equal cooling rates through the casting. The flask contains a sand mold A for casting an iron piston B, this being given as an example of a large casting having different thicknesses of metal, which unless specially treated would not cool uniformly. The drag C of the mold has a spiral coil D, placed as close to the face of the mold as is practicable, to which water is supplied through a pipe E, in which is a valve for regulating the flow. The other end of the coil D communicates with a vessel F for receiving the waste water through a pipe G. The cope H of the mold is also provided adjacent to the face of the mold with a spiral coil, supplied with water through a pipe J, in which is a valve for regulating the flow. The other end of the coil also discharges through a pipe into the vessel F. In this form of casting the core which provides the piston-rod opening, has a coil of pipe connected at one end to a supply pipe K, having a regulating-valve, and having the other end connected to a pipe which discharges into the vessel F.

The molten metal is poured into the mold, and after the ladle is removed the supply valves are opened and the flow of water regulated according to the desired cooling effect and as guided by the temperature of the waste water from the discharge pipes. The form, number and location of the cooling pipes will obviously depend upon the size and shape of the casting. It may be sometimes desirable—as, for example, in the case of the piston shown or in the case of a pulley—to cool the inner portions more rapidly than the rim in order that the final shrinkage of the rim may serve to bind the structure together in a manner similar to that of a shrunk tire and the invention is adapted to that end.

A Shaft Coupling.

A shaft coupling invented by George L. Estes, of Rochester, N. Y., is illustrated in Figs 1, 2 and 3. Figs. 1 and 2 are longitudinal and end views, the former in section, of the coupling. Fig. 3 is a cross sectional view at the middle of the coupling, as shown in Fig. 1. The sleeve A surrounds the ends of the shafts and is provided with conical surfaces tapering toward each end. This sleeve is divided by slots B in order



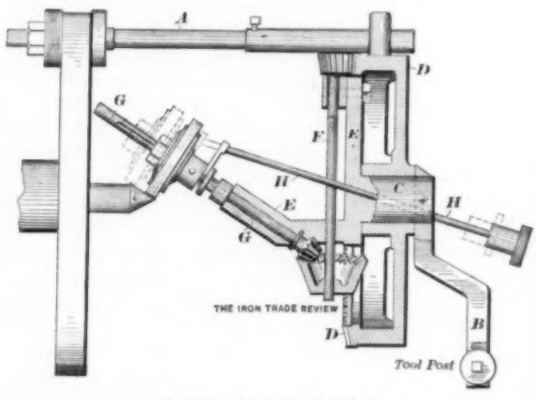
A COMPRESSION COUPLING.

that the various sections may be tightly compressed into contact with the shafts. There is an annular rib at the center of the sleeve to overlap the ends of the shafts and give strength to the sleeve at the point where it is subjected to the greatest strain. The clamping plates are arranged upon a hub C, the bore of the hub being tapered to correspond with the surface of the sleeve. The ends of the sleeves are compressed by the aid of bolts extending through the openings in plates and hubs. The clamping plates have rims giving a drum shape to the coupling and permitting it to be used as a pulley. There are openings F in one of the plates through which a drift may be inserted to start the other clamping plate after the bolts have been removed.

The sections of the sleeve are supported by bands E extending between the neighboring parts, the bands are thin and elastic to free the shafts when the clamping plates are removed and to yield slightly when being applied to a line shaft.

A New Center Grinder.

A center grinder invented by Thomas Coulter, of Brooklyn, O., has a detachable arm A connected to the faceplate. A



CENTER GRINDING DEVICE.

bracket B is clamped in the toolpost and has a hub at C on which is mounted a crown wheel D with the teeth on the side of the wheel near to the faceplate of the lathe. On the side of the wheel D is a stationary frame E fastened to C. One arm of the frame E is in the plane of the crown wheel and the other projects toward the faceplate at an acute angle.

A shaft F fits easily in a bearing in one arm of the stationary frame E and has a pinion meshing with the teeth of the crown gear and at the other end has a cup shaped gear meshing with a bevel pinion on the shaft G. This shaft G has a loose hub on which is mounted an emery wheel. The

hub of the emery wheel slides on the shaft G and rotates with it, the hub having a sliding key connection to the shaft as well as a circular groove embraced by a fork on the adjusting rod H. The rod H has a knob at the end by which the emery wheel is traversed along the cone of the center. When the faceplate of the lathe rotates the arm A strikes the lug on the wheel D, the large number of teeth driving the small pinion on F at great speed and this is further increased by the relative size of the other bevel gears. The degree of taper is adjustable at the toolpost, the angle at which the pin strikes the arm A, or any sliding motion of the one on the other being of but little consequence.

Lubricating the Die-Stock.

Mechanics generally have had the advantage of a "breathing spell" when applying lubricant to the cutters of a die-stock, but if one invention comes into common use that moment will be in danger of shrinkage. William Haythorn, of Chicago, utilizes the body of the die stock as a reservoir for the lubricant and fits up the contrivance with a view to shelving the oil can so far as dosing the threads is concerned. Fig. 1 is a plan view of such a die stock and Fig. 2 is a section along the center line of Fig. 1. The oil chambers are shown at A on either side of the opening B through which the rod or pipe passes while being cut. The ends of the die stock are bored

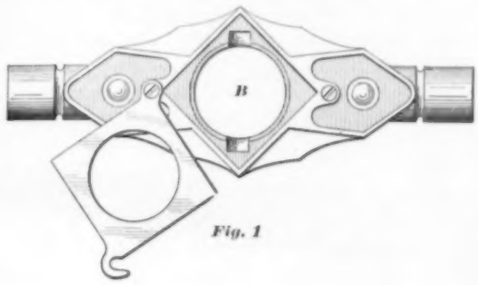


Fig. 1

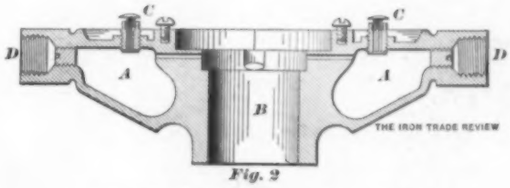


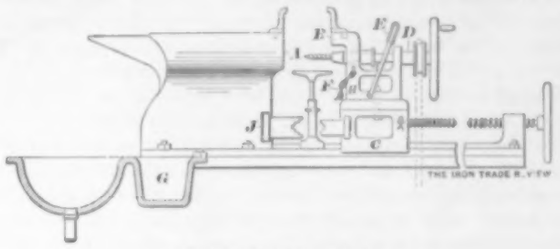
Fig. 2

A COMBINATION DIE STOCK AND SQUIRT CAN.

and tapped at D for the handles. There are openings from D to the oil chamber A at each end of the die stock, these openings allow the removal of the cores when the stock is made and they are plugged afterwards as shown. Channels extend from the oil chambers A to the main opening B through the die stock. At C are the screw plugs and air valves. These plugs are squared at the top to admit of ready removal in order to fill up the oil reservoirs. The design, it will be noticed, is intended to apply the oil where it is most needed, directly at and in front of the cutting points.

A Tool Combination.

Another inventor, William L. Bear, of Williamsport, Pa., has an even more numerous and certainly more elaborate combination of tools than the last mentioned inventor, but for some reason the oil can has been omitted in his case. The illustration depicts an elevation and partial section of the machine aggregation. The whole thing is attached to the one bedplate. There is an anvil with face, horn and hardy of apparently the usual construction, but the end opposite to the horn has a serrated face A forming the jaw of a vise, an opposing jaw B being formed on a sliding frame. A tool-holding frame C slides along ways on the bedplate and is moved from right to left when required by means of the screw and handwheel. A drill spindle D, which is destined to service as a lathe spindle when so needed, is carried by the frame H and operated by the belt and pulley, or by the hand wheel; a lever E pivoted to the frame and in contact with the spindle sleeve is for the purpose of feeding the drill. The frame C and H are bolted together in order that the upper half of the frame may swivel to drill at various angles. A girth chain F is attached to the side of the frame to act as an abutment in drilling pieces which are not suitable for placing against the anvil end of the machine. Supplementary jaws are seen above the ones at A and B; these can be removed and changed as the work demands. There are undercut slots at J for



A MACHINE TOOL CROWD.

vise jaws when clamping pipe or similar round objects. There is a tool rest near the lathe spindle and clamped to the bed is a forge G and water pot. Quite a number of things are comprised in the machine and not too many of them can be used at the same time.

Oil Can Improvement.

Lubricating the die stock without the aid of the squirt can is not more revolutionary than the effort of another inventor to present the oil supply in a very unusual form. George W.

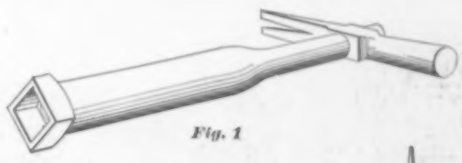


Fig. 1

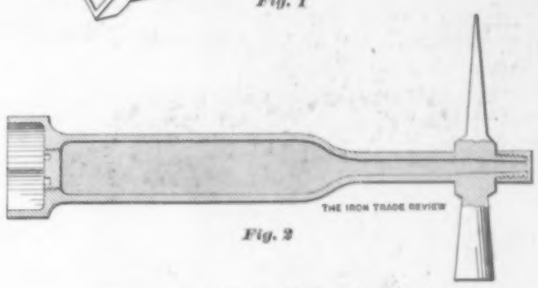


Fig. 2

AN OIL CAN AND OTHER THINGS.

Daniels, of Springfield, O., is not content with that achievement alone, but rolls the oil can up with a number of other things. He proposes a combination oil can, hammer, socket wrench, screw driver, and has still left a part of the tool which comes in more or less handily for the pulling of tacks and nails. Fig. 1 is a perspective view of the combination and Fig. 2 is a sectional illustration. A screw cap is removed when the oil is required.

The directors of the American Axe & Tool Co., have ratified the sale of the plant of that company at Millhall, Pa., to the Mann Edge Tool Co., of Lewiston, Pa., and the original Robert Mann plant passes back into the hands of his children and heirs. A new company has been formed with a capital of $200,000 all of which has been taken by the heirs of the late Robert Mann. The plant will be operated by this company, with W. H. Mann as superintendent and A. C. Mann as general manager.

The Dwiggins Wire Fence Co., Anderson, Ind., whose plant was established a year ago, has been very successful, and the recent increase of the capital stock was to have more money in the business, so it could always discount bills, as it has done in the past. During the past year the company's business has increased two and one-half times what it was last year.

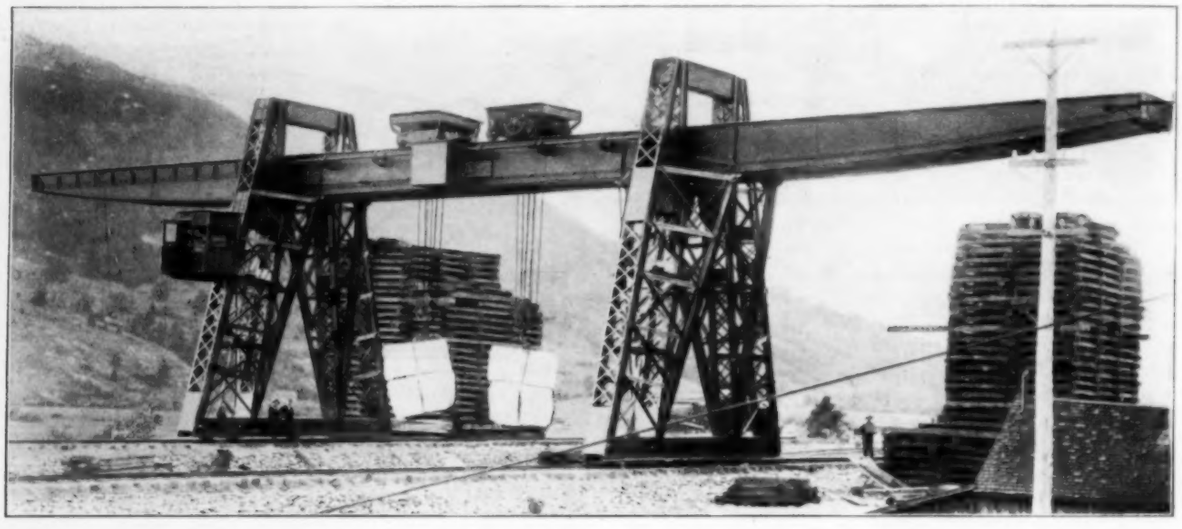
The roll shop of the Lorain Steel Co., Lorain O., has been shut down. The men had been engaged on repair work.

A 50-TON TRAVELING CRANE.

The illustration shows a five-motor traveling crane, 50 tons capacity, recently installed in the yards of the Vermont Marble Co. at West Rutland, Vt. It is equipped with two trolleys, each of 25 tons capacity. The distance between the truck frames which support the bridge is 60 feet, and the overhang of each cantilever arm 50 feet. The total length of bridge is 160 feet. The bridge has a maximum capacity of 50 tons in the middle of the span and the cantilever arms are designed to support 10-ton loads with trolley at extreme outside position. The height of lift for each hoist is 30 feet.

All movements are operated by independent electric motors especially designed for crane service. The speeds for maximum loads are as follows: Hoist, 15 feet per minute; trolley travel, 160 feet per minute; bridge travel, 150 feet per minute. The trolleys, bridge motor and mechanism are covered and the cage enclosed for outdoor service.

The bridge consists of two box girders, supported on truck frames placed 60 feet apart. These girders are of heavy construction to resist lateral forces. Web stiffeners are liberally used and also diaphragms connecting the two web plates in each girder. The truck frames are built up of structural shapes and are well braced in every direction. Connections to bridge girders cover a distance of 17 feet. Both truck frames are open to permit the load passing through them. Truck frames terminate at bottom in built up girders, each carrying two cast steel pivoted trucks which permit of vertical movement to provide for inequalities of the track. Wheels are fitted with double flange rolled steel tires.



A 50-TON TRAVELING CRANE.

When erecting the crane the bridge girders were riveted up on the ground. Each girder was shipped in three pieces, the field joints having all members staggered. Bridge girders were riveted together on the ground and trolleys placed in position, and entire bridge with trolleys was raised by means of 40-ton hydraulic jacks. The cribbing of railroad ties shown in the illustration was placed under the bridge as it was raised. When at a proper height, the truck frames were raised in parts and connections made. All field joints are riveted. By means of temporary wiring connections, the truck frames were raised by means of the hoists on the trolleys themselves. In fact, these trolleys were in operation all the time the bridge was being raised in hoisting up ties for the cribs. The total weight of the completed structure is about 280,000 pounds. A railroad track runs midway between the two tracks on which the gantry operates. Marble blocks will be taken from cars on this track and stored, and will also be delivered from yard to cars in like manner. The space covered is 160 feet wide and 600 feet long. Two of the company's marble quarries are at the right of the picture. The gantry crane will take the place of seven derricks with which the old yard is equipped. As each derrick required a man, seven in all, and the gantry only one man for manipulation, the saving is apparent. The gantry crane is much more economical of space and can handle loads with greater rapidity. The illustration shows a load of about 25 tons on each trolley. The crane was manufactured by the Whiting Foundry Equipment Co. of Harvey, Ill.

THE GOVERNMENT'S NEW DREDGING EQUIPMENT.

A large amount of river and harbor improvement work is now under way or contemplated by the United States Government and just now ten suction dredges are being built, two of which will be sent to the Great Lakes, two to New York harbor, two to the Mississippi river, two to Charleston, S. C., one to Galveston and one to Savannah, Ga.. Five are being constructed by the Maryland Steel Co., two by the Jas. Reilly Repair & Supply Co., and one each by the W. R. Trigg Co., the Petersburg Iron Works Co. and the New York Ship Building Co.

The mechanical equipment of the dredges for salt water service will include surface condenser outfits with Blake air pumps, feed pumps, fire pumps, etc. The dredges for the Great Lakes are provided with very large Blake cross-compound double-acting, air pumps and jet condensers with Blake vertical duplex feed pumps, fire pumps, etc. The air pumps are of novel arrangement. It is possible by the manipulation of valves and cocks to cut each pump in half and run one side entirely independent of the other side. This practically provides a spare pump in each installation without the necessity of being overweighted with two duplicate machines, and at the same time secure the advantages of compound steam cylinders.

These dredges are the largest in capacity ever built. They are self-propelling, sea-going dredges and do not depend upon the assistance of tug boats or other craft to move them from point to point. Some are fitted with immense bins in which the dredged material is deposited. When they are full, the vessel propels herself out to deep water and dumps the sand or mud. Others are arranged for depositing the dredged material into large scows fastened alongside the vessel.

A long flexible tube 12 to 15 inches in diameter drops down from the side of the vessel 20 to 30 feet to the bottom of the river or harbor upon which the dredging operation is being performed. The upper end of this tube is connected to an immense rotative centrifugal pump revolving at several hundred revolutions per minute and capable of handling many hundreds of tons of water per hour. The lower end of the tube is manipulated from the vessel against the sand bars and mud banks and as the water is sucked upwards by the centrifugal pumps a very large proportion of sand and mud goes with it. The centrifugal pumps discharge this water with its suspended material into the tanks on board the vessel or into scows, where the heavy matter quickly settles to the bottom, the water flowing back into the sea.

The Money Value of Technical Training.*

BY JAMES M. DODGE, PHILADELPHIA.

Technical training may be self-acquired or obtained through instruction. The ability to drive a nail properly, or to design and construct the most complex and wonderful of structures or devices, is the result of technical training in but different degree. Up to a very recent date, and within the memory of most of us, the apprentice system and that of independent delving represented the sole methods of acquiring training. Research and investigation carried on in individual lines, with varying degrees of success, dependent upon the mental make-up of the individual, were the means of attaining theoretical technical knowledge. The blending of these two methods developed the earlier mechanical engineers and will, even in the future, enable those sufficiently gifted by nature and habit to attain eminence. The progress of the world, however, calls for a better and more speedy means of producing trained men than could ever be developed by the methods of self-instruction. The individual, striving for manual skill, attains his desire under the old apprentice system. Individuals sufficiently gifted arise above their fellows, and become the leaders in their calling. The gratification of a mechanical appetite and the desire to earn more money than his fellows are two moving causes which impel a man towards technical education. A generation or so ago, the universal belief was that the sooner a young man entered upon his apprenticeship, or began practical manual work, the better and more rapid would be his progress in the mechanic arts, and book learning was derided as being purely theoretical, and of little practical value. This belief is, even at this date, all too prevalent, largely due to inherited error and to lack of knowledge and reliable data.

Four Groups of Workers in Mechanics.

Obtaining data from which incontrovertible conclusions can be drawn is now comparatively easy, but a few years ago was practically impossible. We are all prone to take extreme cases of success or failure as the basis of our opinions, and lose sight of the fact that it is the average man whose career shows the true force and direction of the current. For convenience of comparison, I will outline the actual progress made by four groups of men working in the mechanic arts—the unskilled labor group, the shop-trained or apprentice group, the trade school group, the technical school group—and give the results attained. Each group I will refer to as an individual:

The first, the laborer, with but primitive and rudimentary training, working under the immediate and constant supervision of a boss, and earning, as the line on the chart indicates, $10.20 per week at the age of 22, his line remaining horizontal through the period of his usefulness. Data are lacking as to his progress before he reaches the age of 22.

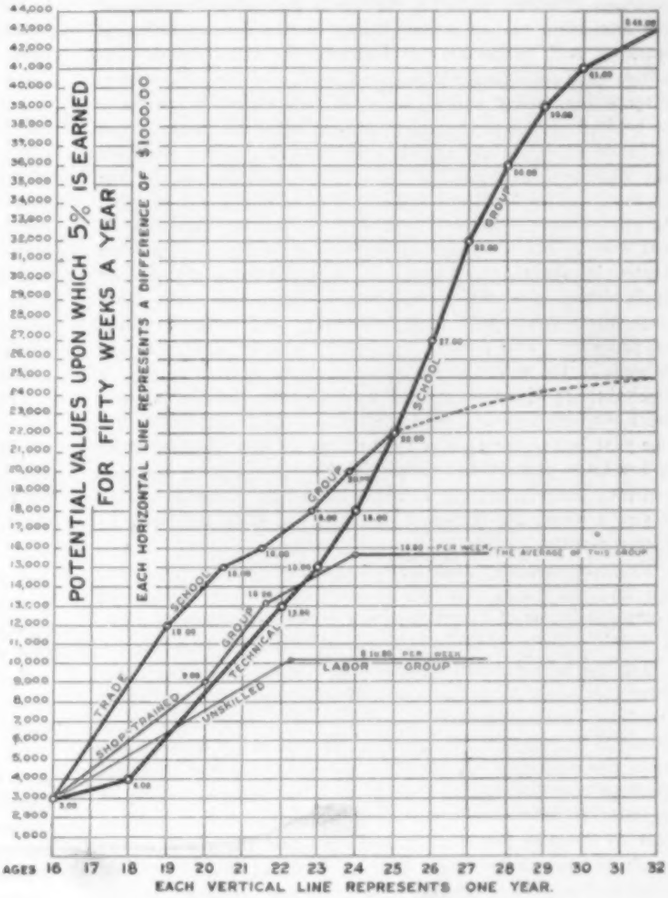
The second, the apprentice or representative of the shop-trained group, of good health and habits, entering a machine shop at the age of 16, and earning an average wage of $3 per week for fifty weeks per year, which is about the number actually worked, is $150, or 5 percent on $3,000. This, then, is his potential or invested value, upon which he draws his interest on pay days.

On the chart accompanying this paper you will find, ruled horizontally, lines representing amounts increasing from the lower line upward by $1,000 each, starting at $1,000, these representing potential values, upon which 5 percent is earned for fifty weeks a year. The vertical lines each represent one year in time, beginning at the lower left hand corner at 16, and progressing in regular order until, at the lower right hand corner, we have 32, representing in all a lapse of 16 years.

The Shop-Trained Man.

To illustrate the progress of the four groups graphically, we indicate on the line representing 16 years of age, and opposite the figure $3,000, the young man just entering his apprenticeship. We will consider him typical of the shop-trained group. Following the line to the right we see his average progress in earning capacity through the ensuing years, noting that at the age of 20 he is earning $9 per week, which is 5 percent on $9,000, he having increased his potential or invested value in four years by $6,000.

We now note that his accumulated experience enables him to make more rapid progress for the next year and a half, and from the age of 20 to 21½ years we find that his pay has increased to $13.20 per week, and his potential value to $13,200. He is now approaching his goal, and his line of progress does not continue at the same angle that it followed for the past few years, but deflects toward the horizontal; and at the age of 24 we find him earning $15.80 per week, and his potential value $15,800. In other words, in eight years he has increased his potential value $12,800. Observation shows that 5 percent of the apprentices acquiring the machinist trade rise above the line made by our average


POTENTIAL VALUES UPON WHICH 5% IS EARNED FOR FIFTY WEEKS A YEAR
EACH HORIZONTAL LINE REPRESENTS A DIFFERENCE OF $1000.00
AGES 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
EACH VERTICAL LINE REPRESENTS ONE YEAR.
SCHOOL
GROUP
TRADE
SHOP-TRAINED
TECHNICAL
UNSKILLED
LABOR
GROUP
$10.20 PER WEEK THE AVERAGE OF THIS GROUP

man; 35 percent follow the line closely, and that during the period of training 20 percent leave of their own accord, and as near as can be ascertained, go to other shops and continue in the line originally selected; 40 percent, however, are found unworthy or incompetent, and are dismissed, probably never rising to the $15.80 line.

Apprenticeship of today in many establishments does not make the man, broadly speaking, a mechanic—in a majority of cases he is a specialist or tool hand, and not comparable with the old mechanic, who was a worker in metals, had some practical knowledge of steam and prime movers, could chip, file, work on lathe, planer, drill press, or as an assembler, and was competent to meet the varied and unusual conditions found in general construction and repair work.

Trade and Technical School Men.

The third group of young men are those fortunate enough to have had the opportunity of entering a trade school, which they do at 16 years of age, devoting the next three years of their lives, or until they are 19 years of age, acquiring a trade under competent instruction, and at the same time adding

*From the president's address at the New York meeting (December, 1903) of the American Society of Mechanical Engineers.

to their store of rudimentary theoretical education. At the age of 19 a trades-school man enters the machine shop and can command $12 per week, equal to the apprentice at 21 years of age, and very quickly makes his employment profitable to his employer. The three years in school have increased his potential value from $3,000 to $12,000, a gain of $9,000. Thus he has caught up with the apprentice entering the shop at 16, and who has been working for five years. Progress of the trades school group now follows a line which diverges from that of the regular apprentice, and by the time $15.80 is earned by the regular apprentice, the trades school graduate is earning $20, with a potential value of $20,000, or $4,200 greater than that of the shop-trained man. The trades school line continues at substantially the same angle up to an earning capacity of $22 per week, and a potential value of $22,000. Data are lacking as to the further progress, but the presumption is that this line will bear off more toward the horizontal, eventually paralleling the line of the shop-trained man, but much higher on the chart.

The fourth group we will represent again by a boy of 16, studying at school until his 18th year, and preparing himself for admission to one of our higher institutions of technical learning, such as the Stevens Institute, the Massachusetts Institute of Technology, Columbia, Cornell and the like, where, after a four years' course, or at the age of 22, he is ready to begin practical work. The statistics upon which this chart is based show the average starting wage at $13 per week, or the same amount earned by the regular apprentice at the age of 21½, and by the trade school graduate at the age of 19½. In other words, apparently a graduate of our technical schools has lost by his six years of preparatory study, having been beaten by the regular apprentice by six months and by the trade school graduate by 2½ years. From this time, however, there develops a most interesting and instructive line of progress. The regular apprentice, who is earning $13.50 a week at the time the technical graduate is earning $13, is overtaken in six months, and we find both earning $14 per week, and the technical graduate reaches the $15.80 line nearly one year before the regular apprentice. In other words, while it has taken the regular apprentice from his 21st to his 24th year, or three years, to increase his wages from $11.50 to $15.80 a week, the technical graduate has done the same in fifteen months.

Progress now continues on substantially the same line, and we find the technical graduate earning $22 per week, and crossing the line of the trade school group in three years' time, a worthy tribute to the higher education and attainment.

The line of the technical graduate now continues divergent from that of the trades' school graduate, with earning capacity regularly increasing, and a corresponding augmentation of potential or invested value until, at the age of 32, or ten years after entering upon the practical work, we find our technical graduate earning $43 per week, and his potential value at $43,000. In other words, six years of preparation have enabled him to distance the shop-trained man and the trade school graduate overwhelmingly. Bearing in mind that this is an average line, it is of interest to say that most technical graduates with a better record than the one in the chart have devoted even more time to their preparation, either by study or by shop work, after graduation. Those, on the other hand, who have not come up to this average line represent, in the main, men more or less incapable of original work. The reason that higher education, other things being equal, carries with it the ability to earn high wages is that consciously or unconsciously, these men are directing and making it possible for large numbers of laborers, shop-trained men and trade school graduates to perform useful work. A draftsman at his board may never realize that as a result of his drawing a hundred men or more may be given employment. His design calling for structural steel, for instance, could not be built were it not for the labor of many men employed making and rolling the steel before it reaches the shop. Then come the shop men, who cut, punch and shear, and then the erectors, who assemble the structure in accordance with the original plan. For this ability and knowledge our technical man is paid.

It is quite obvious that all workers in the mechanic arts cannot be technical graduates. Some must, through natural limitations, or lack of opportunity, follow the apprentice line, and others the trade school. It is from graduates of the latter that leading shop men and foremen are largely selected. These two classes, supplemented by the technical graduate, constitute the vast army of workers in the mechanic arts. Thus we see clearly that preparation pays, and that it pays in dollars and cents, and that even a long term of years spent in proper study and technical training is a good investment from every point of view.

Of course, apprentices have made and will make, in rare instances, a better showing than the average technical man of the chart, and many of our greatest men have, by sheer force of character, excellent of brain fibre, persistence and self-education, risen to preëminent positions, independent of all regular systems. To the end of time great examples of this kind will be found. Among those whose names readily come to mind are the elder Krupp, Joseph Whitworth, George M. Pullman, Andrew Carnegie, John Fritz, Prof. John E. Sweet, Edwin Reynolds, George H. Babcock and Coleman Sellers.

The same is true of the trade school graduate, but as said before, we are dealing with the average of each class, taken from actual statistics, with an earnest desire to ascertain the facts, and without any preconceived notion of the outcome.

It may be stated as a truism that every man pays for the amount or percentage of bossing he requires, and conversely, every man's wages increase in proportion to his ability to act as the boss or foreman of himself and others. The lower the wage rate the greater the amount of watching and directing constantly required. The slaves of ancient Egypt received no wages, but were treated as horses are today. They were fed and sheltered according to the ideas of their owners. No slave worked voluntarily, and the foreman's or leader's excellence was gauged entirely by his physical strength and efficiency as a driver. This was certainly the zero of labor conditions.

The highest wages are paid to the man through whose ability the largest number of other men may be most profitably employed. He does his work with his brain. Thus, on the one hand, we see manual labor receiving no wages, and on the other mental labor reaping the highest reward. Between these two extremes is found every condition of human life.

High Value of Technical Training.

A practical man performs his work within the radius of his arm, a technical man within the radius of his brain. This fact is, even today, realized by the few, but it is gratifying to know that the number is increasing. The technical training of an individual makes him valuable just in proportion as his ability is manifested by good judgment and perception. Trained common sense receives the highest compensation and reaps the greatest reward. Mental ability to receive ideas and impart them properly and wisely, rearranged and grouped, is typical of the most brilliant mentality; a dull intellect may be compared to blotting paper, fit only to absorb and inter a heterogeneous mass of impressions.

The most interesting of all graphical charts would be that properly exploiting the value of technical training to manufacturing plants and enterprises. To illustrate this more clearly, we may fairly assume that the apprentice of our chart corresponds to the old-fashioned primitive shop, having practically no overhead expense, the proprietor carrying the business "in his hat," priding himself on his non-receptive sturdiness, contempt for improvements and personal attention to all details. For his costs he adds together the value of raw materials and labor, and then adds a few dollars for profit. The line of this establishment would parallel the $15.80 line of our shop-trained group.

The trade school line on the chart truthfully represents establishments in which some attention has been paid to the improvement of system, with an increased so-called non-productive force, operating possibly in some particulars with brilliancy, but with defective features in others; acknowledging the value of improvement if internally originated; moderately but unconsciously absorbent of ideas from without, but tenacious of dogma and lacking departmental symmetry. Growth, increased earnings and relative immunity from disastrous failure result.

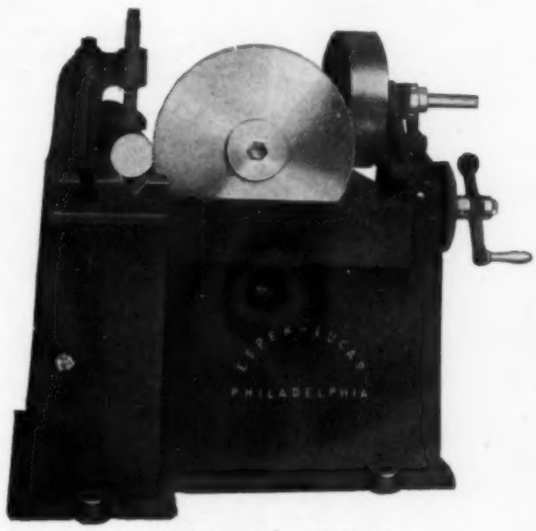
The technical graduate line of our chart represents the manufacturing establishment technically trained and "abreast of the times" in all particulars, and I predict a time not very far distant when it will be almost universally recognized that establishments should be trained as well as individuals, and that the marvelous development in scientific shop practice and management will do for the manufacturer fully as much as technical training is doing for the individual.

A change of mental attitude towards the subject of advanced shop practice and management is noticeable to a marked degree. Within a very few years, indifference and antagonism have changed to a growing interest and appreciation.

It may be truly said that this society, and others allied in promoting the mechanic arts, complete the system of technical training by going beyond the province of the technical schools, their students being the men who constitute the management of our manufacturing enterprises. It should be gratifying to all of us that the pioneer literature of advanced shop management and practice for this post-graduate course of technical training was presented to the world by the American Society of Mechanical Engineers.

COLD SAW CUTTING-OFF MACHINE.

A new style cold saw cutting-off machine has been designed and built by the Espen-Lucas Machine Works, of Philadelphia. This machine will saw up 4-inch round stock and structural



A NEW CUTTING-OFF MACHINE.

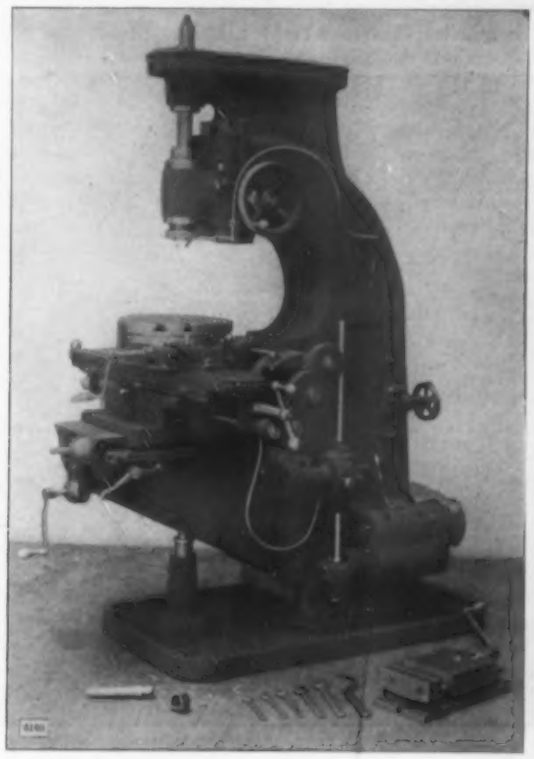
shapes up to a 6-inch I-beam at a single cut. There is a variable and automatic feed, automatic safety stop and swiveled clamps on the platen for holding different shapes and sizes of material to be cut straight or at an angle. The clamps can be entirely removed and thus allow jig work to be placed on the table. The drive is by a hardened crucible steel worm and phosphor bronze worm wheel running in an oil bath. The machine occupies very little space, not more than the ordinary power hack saw, and the metal is judiciously distributed throughout the base, making it very rigid, eliminating the spring and strain which would naturally be expected when cutting large stock on so small a machine. A 14-inch saw is carried on a hammered crucible steel spindle of liberal proportions and a countershaft supplied with the tool permits the machine to be placed in any convenient corner of the shop.

The Champion Shoe Machinery Co., St. Louis, Mo., is now commencing work on manufacturing wax thread sewing machines to be used by shoemakers. The company also manufactures sewing machines for sewing harness and leather in all branches. The capital stock is fully paid up. All the members of the company have had experience in the business. J. B. Dobyne, president and treasurer, was connected with the Landis Machine Co., of St. Louis, and G. A. Dobyne, vice president, was superintendent of that company.

AUTOMATIC VERTICAL MILLER.

The main casting of this machine is hollow and bolted to the bed plate, which latter has a raised rim for the reception of chips, soda water, etc. The lower part of the stand serves as a tool closet. The spindle bearing slide is vertically adjustable by handwheel and screw. A ring scale on the handwheel spindle enables this adjustment to .001 inch. The lower cutter spindle journal is hardened and ground, and runs in an adjustable phosphor-bronze bearing. The counter pressure is received by hardened and ground thrust rings. A screw passing through the spindle drives the cutter or the arbor into the spindle cone or withdraws it therefrom. For the reception of cutters with inserted teeth the working spindle has a thread on its lower end. It is driven by a triple stepped pulley, a vertical shaft with bearings in the main casting, and change gear. As the countershaft is arranged for two speeds, the working spindle has thus six rotation speeds.

The cross slide, which has an oil groove all around it, has three T-slots, and at each end a hand crank. Its automatic transverse feed in both directions is thrown in and out by adjustable dogs or "trips." Its drive is effected without belts,



A VERTICAL MILLING MACHINE FROM GERMANY.

by means of change gears, at nine different speeds, which are variable during the cut, by a hand lever. The feed of the cross slide in the line of the bracket is effected either by hand or automatically, and is adjustable to .001 inch. The cross slide bracket is vertically adjustable by crank and screw spindle to .001 inch. There is now no hole in the floor necessary for this spindle, as was formerly the case.

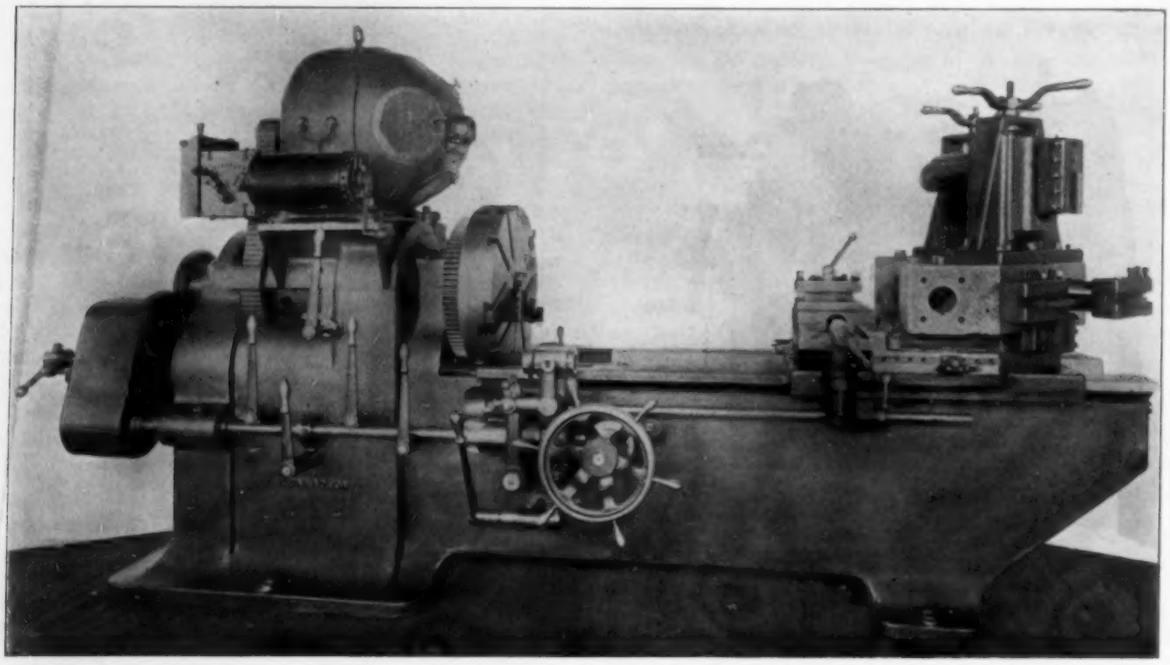
The dimensions and capacity of this tool are as follows: Diameter of the work spindle, 24.4 inches; vertical adjustment of the spindle-bearing slide, 6.2 inches; greatest distance of lower face of working spindle from the surface of the cross slide, 23.6 inches; automatic feed of cross slide per rotation of cutter spindle is alterable between limits of 0.003 and 0.26 inch; width of pulley steps, 3.35 inches; net weight of machine, 710 pounds. This tool is made by Ludwig Loewe & Co., of Berlin, Germany.

The Irondale tin plate plant, Middletown, Ind., has closed and employes are seeking employment elsewhere. The plant was the largest industry of he town, giving employment to about 250 men.

A HEAVY TURRET LATHE.

A lathe capable of doing at one setting the operations that would ordinarily require eight or more settings, is known as the Conradson 24-inch semi-automatic turret lathe, and is manufactured by the American Turret Lathe Mfg. Co., of Warren, Pa. Being intended for heavier work than is usually imposed upon a turret lathe it has a massive bed construction, a large turret and is designed to swing 27 inches for a distance of 12 inches from the chuck. Twelve rates of spindle speed and eight feeds of the turret are possible with each speed of the motor. The gear combinations for all of these are protected and may be operated to effect a change in speed, while the machine is running. The levers for the various gear clutches are shown under the head. The turret has universal facing heads and provides thirteen actual tool positions though seldom more than five are used at one time. An auxiliary turret, which will accommodate four tools and has power cross feed, is on one side of the main turret. The latter has rapid power traverse in either direction afforded by a separate motor, and a slower travel through the feeding mechanism driven from the spindle. Rotating, indexing and clamping of the turret head are all automatic, and an independent "knockout," or feed stop, serves each face.

The spindle is driven through a Renold silent chain by a 10-horsepower Crocker Wheeler semi-enclosed motor mounted above the headstock. An M-12 controller in the current supply allows the motor twelve speeds ranging from 876 to 130 revolutions per minute. With the combination of electrical and mechanical means the highest and lowest possible chuck speeds are 90 and 1 1-5 revolutions per minute, respectively. For the operation of the turret a 3-horsepower Crocker Wheeler fully enclosed motor is used. This runs continuously at a constant speed of 1,100 revolutions per minute on a two-wire supply and drives a steep-pitch lead screw through bevel gearing. A longitudinal shifting of the driven shaft clutches one or the other of two bevel gears, producing direct or reverse rotation, or in the central position releases both.



CONRADSON LATHE WITH CROCKER-WHEELER MOTOR.

The Northern Engineering Works, crane builders, Detroit, Mich., report among recent sales, electric cranes of from 5 to 25 tons capacity to the following firms: Gerst Bros., of St. Louis; 3 cranes to Olds Gasoline Engine Works, Omaha & Council Bluffs Railway Co., American Steel & Wire Co., Green's Car Wheel Co. Hand power cranes of like capacity have been sold to the Cambria Steel Co., Jackson & Church, Indianapolis & Cincinnati Traction Co., besides several smaller electric and hand power cranes.

The Western Machinery Market.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, CHICAGO, Nov. 30.

The machinery trade has had varying phases in the West during the past month. At the opening business was dull, following the condition that was so marked in October, but it has gradually improved and the new month is ushered in under more favorable auspices than for some time. This statement applies not only to machine tools, but also to engines and boilers, power transmission machinery and other equipment. There appears to be a feeling of greater confidence in the market, attributed in part to the cuts made in the prices of some raw materials and this changed feeling augurs well for the future. It cannot yet be said, however, that trade is good; there is only an improvement over the business transacted in September and October. As proof of this, South Canal street dealers who generally are credited with keeping a close watch on the indicator of the business world, report that "pick-up" orders are in greater number. There is, however, a marked absence of complete shop outfit inquiries, and those pessimistically inclined (and there are always a few) point to this as an indication of the decrease in construction work and proof that conditions are as bad as bad can be. Most merchants say, however, that this feature is only another illustration of the general adoption of a policy of retrenchment consequent upon the termination of the boom that lasted for so long. It is significant, however, that the bulk of the trade transacted during the past month emanated from points outside of Chicago, as it is also true that a large percentage of the second-hand tools being offered for sale come from these districts.

Much of this improvement may be traced to reductions in the price of mechanical equipment, some dealers offering attractive discounts in the effort to dispose of their surplus stocks.

Pulleys, shafting and transmission equipment are lower, and builders of heavy steam power units, particularly those with large outputs to market, have in some instances been shading their prices to suit the changed conditions. On the whole, the outlook is considerably better than it was a few weeks back, and with the gradual readjustment in the costs of labor and semi-finished materials, the machinery trade is settling down to a normal yet conservative basis.

The George Whiting Co., Chicago, manufacturer of punches and shears, in forwarding us a list of the recent sales and shipments of its tools, advises us that it does not find the business conditions as unfavorable as is generally complained of. Orders are being received in sufficient quantity to keep

the company's plant in operation to the fullest capacity, and inquiries in the market show that a good volume of business is yet to be booked. The president states that if present conditions continue, as he anticipates that they will, the capacity of the shop will have to be increased to take care of the growing demand. Among the orders booked during the month, the following are noted: Mertes, Miller & Co., Milwaukee, Wis., one 42-inch punch, capacity 1-inch hole in 1-inch plate, fitted with boilermaker's jaw; Scully Steel & Iron Co., Chicago, for shipment to the Holthoff Machinery Co., Cudahy, Wis., one combined riveter and punch with 5-foot stake and capacity to drive ⅞-inch cold rivets; Illinois Steel Co., Chicago (North Works), one straightening rolls, arranged for motor drive, to straighten 1-inch cold plate steel; Marshall & Huschart Machinery Co., Chicago, for shipment to the Pittsburg Steel Construction Co., Pittsburg, one 18-inch punch with capacity 1-inch hole, 1-inch plate, fitted with structural jaw and angle punching attachment; Lemley & Schultz, Chicago, one 15-inch punch, capacity ¾-inch holes in ¾-inch plate, fitted with structural jaw and cross cut shear attachment; Marshall & Huschart Machinery Co., for shipment to Lake Superior and Ishpeming R. R., Marquette, Mich., one 30-inch punch with plain jaw, capacity 1-inch hole in 1-inch plate, fitted with splitting shear attachment; also one set of belt power bending rolls, 10 feet 2 inches long, fitted with friction clutch pulleys; Mogg Coal Co., Chicago, one combined belt riveter and punch with stake 49½ inches long, capacity to drive ⅞-inch rivets; Skillin & Richards Mfg. Co., Chicago, one rotary shears, capacity ¼-inch plate steel; Standard Forgings Co., Indiana Harbor, Ind., four axle cutting-off machines, also one centering machine; John A. Mead Mfg. Co., Grand Crossing, Ill., one revolving head shear, 48-inch throat, capacity 24 inch, ¾-inch plate steel each stroke; also one heavy beam coping punch to take from 6-inch to 24-inch beams inclusive; Lacy Mfg. Co., Los Angeles, Cal., one combined belt riveter and punch with stake 49½ long, capacity, ⅞-inch cold rivets; Jos. T. Ryerson & Son, Chicago, one 15-inch punch structural jaw, capacity, ¾-inch hole in ¾-inch plate steel; E. A. Kinsey Co., Cincinnati, O., for shipment to Alvey Ferguson & Co., Louisville, Ky., one 15-inch punch sturctural jaw, capacity ¾-inch hole in ¾-inch plate.

The Danville Foundry & Machine Co., Danville, Ill., manufacturer of engines and mining equipment, advises us that orders received last month compared favorably with the volume of business booked in any month during the present year. The company has just completed a new boiler house and has recently purchased a 14-foot boring mill, which is expected within a few days. It looks for no cessation of business unless the financial condition of the country changes materially from the present state of affairs.

The Gardner Governor Co., Quincy, Ill., manufacturer of air compressors, pumping machinery, etc., states that while business has been good with it during the past month, it has noticed a falling off in orders from certain lines of business which it believes portends a duller period later on.

Writing about export business, the Gardner Governor Co., of Quincy, Ill., says that it has never had such a rush on this trade as it is experiencing at the present time. Its shops are filled with orders for pumping machinery from the following places: London, England; Havana, Cuba; Osaka, Japan; Hungary; Russia; Belgium; Spain; Guaymas, Mexico; City of Mexico; Brisbane, Australia; Perth, W. Australia; and Victoria, B. C. Also heavy governor orders from Winnipeg, Manitoba; Montreal, Quebec; Truro, N. S.; Amsterdam, Holland; and Havana, Cuba. The pump orders are for good sizes and large quantities and the capacity of the pump department will be fully taxed for at least sixty days before shipments can be all completed.

The American Machinery Co., Grand Rapids, manufacturer of pattern shop equipment and wood working machinery, states that shipments during October were 25 percent greater than in the corresponding month of last year and considerably greater than in September of this year; also that the unfilled orders on hand and inquiries pending are larger than usual. Concerning prospects for the future, the company states, "We have every confidence that sufficient trade will materialize to keep us busy although there is unquestionably a disposition, particularly among the larger buyers, to postpone purchases; but we believe that these orders are simply delayed and that conditions will require that they be placed a little later. Collections were somewhat slack during September but have been very good during October." The company contemplates some additions to the equipment of its plant. Orders received since the receipt of the last report made in September are as follows: For Oliver universal saw benches, the Grand Trunk Ry., Montreal, Que.; Boston Electric Spinning Co., Bedford, Mass.; Erie R. R. Co., Meadville, Pa.; Southern, Georgia & Florida Ry.; Bellamy Planing Mill Co., East Florence, Ala.; Western Ohio Ry., Wapakoneta, O.; Rogers Lumber Co., Warren, Pa.; Gustafson Mfg. Co., Chattanooga, Tenn.; Smithsonian Institution and National Museum, Washington, D. C. For Oliver band saws, orders have been received from the Westinghouse Foundries, Trafford, Pa., Gustafson Mfg. Co., Chattanooga, Tenn. For Oliver hand jointers, the Washington Navy Yard, Boston Electric Spinning Co., Georgia Southern & Florida Ry., Western Ohio Ry., Fenwick Freres & Co., Paris, France. For pattern lathes, East Rockford Machine Co., East Rockford, Ill., and the York Pattern Works, York, Pa. For No. 3 Oliver wood trimmers, the Lunkenheimer Co., Cincinnati; Boston Electric Spinning Co., Howard Iron Works, Buffalo, N. Y.; Duke Machine Co., Memphis, Tenn.; Pratt & Cady Mfg. Co., Hartford, Conn.; Pittsburg & Lake Erie Ry., McKees Rocks, Pa.; Gustafson Mfg. Co., A. C. Thompson Co., Ltd., North Sydney, Nova Scotia. For Oliver bench trimmers, Bovaird & Seyfang, Bradford; Gurney Tilden Co., Hamilton, Ont.; W. W. Dimond, Oil City, Pa.; Chicago Pneumatic Tool Co., (3) Frankfort, Pa.; Erie Ry., (2) Meadville. Pa.; East Rockford Machine Co., E. M. Dart Mfg. Co., Providence, R. I.; Morgan Mfg. Co., Jamestown, N. Y.; S. Howes Co., Silver Creek, N. Y.; Howard Iron Works, Buffalo, N. Y. (2); Roemer Bros., Bowling Green, Ky.; Canadian Pacific Ry., Montreal, (3); Central Foundry Co., Baltimore, Md., Osgood, Bradley & Son, Worcester, Mass.; Oil Well Supply Co., Oswego, N. Y.; Cole Mfg. Co., Memphis, Tenn.; Florence Wagon Works, Florence, Ala.; A. G. Plumber, Huntsville, Ala.; Rogers Lumber Co., Warren, Pa.; Wright Wire Co., Worcester, Mass.; Dominion Atlantic Ry., Kentville, Nova Scotia; Thos. Merson, Dartmouth, Nova Scotia; Douglas & Co., Dartmouth, Nova Scotia.

The Quincy Engine Works, Quincy, Ill., reports a quiet month during October as compared with the same period in last year. It states that there have been no notable engine sales, but that the demand for engines of smaller size has been fair; also that it has closed several good sized contracts for special machinery, heavy castings, rope, sheaves, etc.

The Browning Mfg. Co., Milwaukee, Wis., manufacturer of motors and dynamos, states that business has picked up wonderfully well during the past month, as compared with the sales in the three preceding months. It is of the opinion that trade is settling down to a good solid basis and that there is nothing in the market to cause apprehension. The orders received during last month came from all parts of the United States, many of them being repeat orders.

The Trees Mfg. Co., Greenfield, Ind., builder of the Hancock gas and gasoline engines, advises us that it is considering a change of location to Cincinnati, and that if such is made, it is the intention of the company to greatly increase its facilities. The company has been devoting considerable time of late to experimental work on its engine in the effort to develop a thoroughly simple engine not lacking in points that would add to its efficiency. Attention is called to the report from the Indiana State Fair at Indianapolis, in which the Hancock engine was awarded first prize in an efficiency test shared in by a large number of manufacturers of gas and gasoline engines.

The Marinette Iron Works, Marinette, Wis., manufacturer of the Walrath gas engines, advises us that it has booked orders in October aggregating $50,000, and that it has been asked to submit bids on over $100,000 worth of additional work. The company is moving into its new plant at Chicago Heights, Ill., and expects to have the same running within two or three weeks. The new shops have a capacity three times greater than the old plant, giving the company what it states to be the largest and most modern gas engine works in the United States.

The Commercial Electric Co., Indianapolis, Ind., reports that business has been satisfactory and that the outlook is full

of promise. It has enlarged its plant during the past year to four times its original capacity, but does not contemplate any further extensions in the near future.

The Fox Machine Co., Grand Rapids, Mich., manufacturer of pattern shop equipment and wood working machinery, states that business during September has held its own, compared with previous months. An increase in the volume of trade was naturally expected with the approach of fall, and the company believes that after the excitement around Wall street has subsided, orders will increase to the volume the condition of the country warrants. Foreign trade has been fair, though the disturbances in the East have affected business from that quarter.

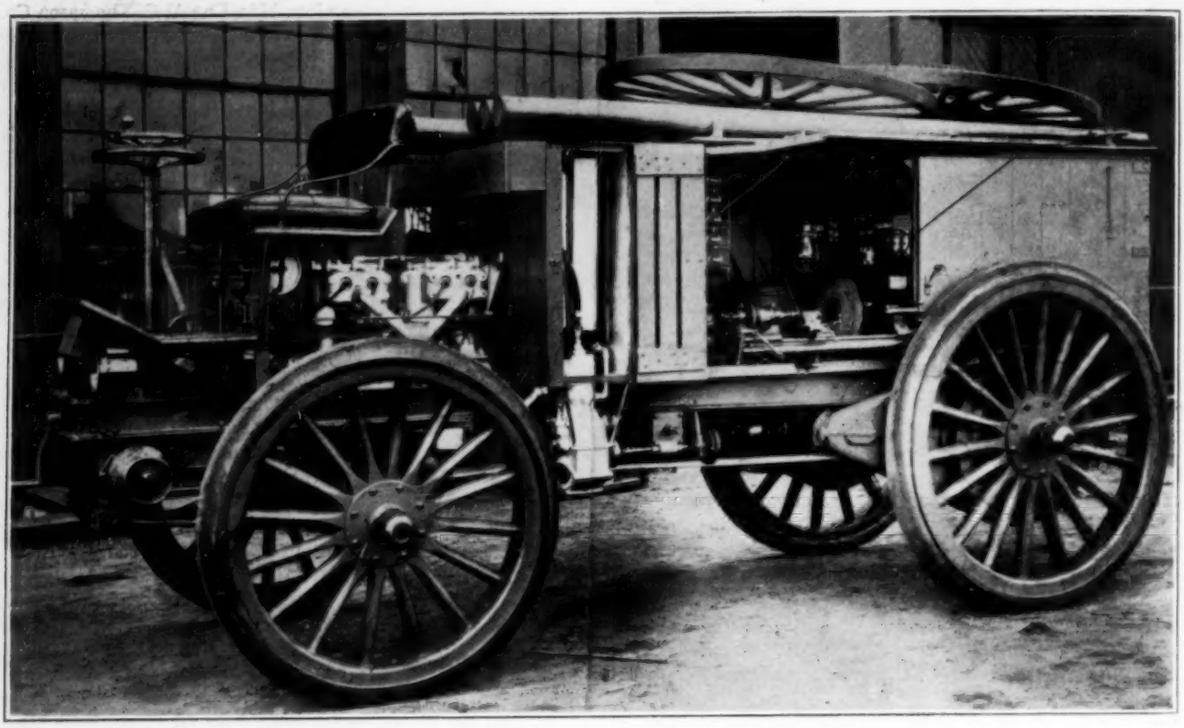
Williams, White & Co., manufacturers of bulldozers, punches and shears at Moline, Ill., report that their orders come in, as a rule, in comparatively small amounts; that is, one or two machines at a time. They have had no large orders. They are building a 1,600-ton hydraulic press for the Rock Island Arsenal. They do not expect to erect any new buildings, or add any machinery in the near future.

The Townsend-Downey Shipbuilding Co., New York, whose yards are on Shooters Island, shut down its plant Nov. 27, locking out 1,600 employes. When the men appeared for work they were informed that the place would close indefinitely because of labor troubles. President Downey, in a statement to the public, says: "The temporary embarrassment of the Townsend-Downey Shipbuilding Co. is directly the result of losses and delay in performing contracts incurred through the abominable conditions prevailing in the labor and material market during the last two years. The exorbitant demands of the workmen and restriction of volume of work done, added to the impossibility of securing promptly from steel manufacturers material for ship construction, has rendered it impossible to operate to advantage. These difficulties and the fact that the credit of the shipbuilding industry has been completely destroyed by recent revelations regarding the promotion of the United States Shipbuilding Co. has for a time prevented the carrying out of the plans of this company."

The Independent Rolling Mill Co. has been organized by the new owners of the Ohio Steel & Iron Specialty Co., at Cuyahoga Falls, O., recently sold under bankruptcy proceedings. The company is not yet ready to announce its plans.

AN AUTOMOBILE MACHINE SHOP.

A battery wagon just completed by the U. S. Long Distance Automobile Co., of Jersey City, N. J., and delivered to the War Department at Washington, is to all intents and purposes a traveling machine shop of automobile type. The machine as illustrated, weighs about five tons and is propelled by a 4-cylinder 24-horsepower gasoline engine. The front wheels are 48 inches in diameter and the rear wheels 56 inches in diameter fitted with Firestone solid rubber tires. The vehicle has four speed changes in the forward direction and there is a reversing gear. There is ample supply of shelves, drawers and compartments for the storage of tools and general appliances and on the top of the machine are placed the extra artillery wheels and poles for the hoist, etc. The machine shop has a lathe, grindstone, emery wheel, forge, anvil, and a dynamo for lighting purposes. The wagon is capable of traveling at a maximum speed of about 10 miles per hour with full equipment of tools, etc., and the quota of men.



AN AUTOMOBILE MACHINE SHOP.

Indianapolis Scrap Market.

A correspondent at Indianapolis writes as follows concerning the scrap market in that city, the prices being those of dealers: "The market is very weak, there being practically no demand for any grade of scrap. Some old material is being sold at quotations named, but most of the dealers are inclined to hold their accumulations. No. 1 railroad wrought, $11 to $11.50; No. 2 railroad wrought, $10 to $10.50; No. 1 bushing or wrought pipe, $7 to $7.25; cast borings, $3 to $3.50; mixed borings, $3 to $3.50; stove plate, $8.75 to $9; heavy cast scrap, $10 to $10.25; malleable, $8 to $8.50; tank and mill iron, $7 to $7.50."

The Martin Machine Works, of Meridian, Miss., have been bought by C. P. and W. C. Wetherbee, of Waynesboro, Miss., who have taken charge, and will organize a new corporation. Improved additions to the plant will be made.

The Highland Iron & Steel Co., Terre Haute, Ind., has closed its plant. The company employed several hundred men. It closes on account of lack of orders.

The Kneneland Mfg. Co., Lansing, Mich., was recently organized to manufacture gasoline engines. A building has been acquired and will be equipped with machinery.

Cincinnati Machinery Market.

CINCINNATI, Dec. 1.—There was some improvement in the demand for machine tools in November as compared with the preceding month, but the trade is still rather light and the shops are not running full time or full force. Opinion varies as to the probable duration of present conditions. There are several elements that lend weight to the view that after the first of the year a much improved trade is to be expected. It is well known that many large corporations are now cutting down their purchases in order to make their balance sheets look better for the end of the year statements. Efforts have been made to secure foreign trade which are already bringing results, and this branch of the trade is expected to show increasing gain. Cincinnati manufacturers are in good position to secure a liberal share of this business. Cincinnati tools have been sold abroad quite extensively and the well known conservatism of foreign buyers in taking those machines which have proved to give satisfaction, to the exclusion of untried machines, places this center in line for the duplication of orders abroad.

As an example of this view of the situation one of our manufacturers received an order for three lathes from an automobile maker in Belgium over a year ago. This was followed by an order for five more of the same machines. In the past week there came an order from the same manufacturer for nine more of these lathes, making in all 17 lathes now sold to one customer abroad. The trade in Germany is said to be picking up to an important extent and concerns which in the past have enjoyed a good trade with that country are again receiving orders from that source.

The domestic demand is not active, but there is enough inquiry to make it clear that there will be machines wanted in the near future. Buyers are more discriminating in their choice of machines now and do not place orders hastily. Many improvements have been made in Cincinnati machines which are expected to make them wanted.

On this point a pertinent comment was made by one of our manufacturers. It was observed that the buyers are now mainly the smaller manufacturers and that the large corporations are buying very little. This will put into the hands of the smaller manufacturers the most effective, up-to-date, time-saving machines, while the larger concerns will be using the old machines, which in point of economy cannot compete with the newer makes. It is observed that the larger corporations will surely feel the force of this competition in the near future and may at length realize that a policy of retrenchment can be carried too far. As an illustration of this feature an experiment was made recently with high speed tool steel. The work was being done in one of the large shops on an old lathe. A local machine tool company took some of the pieces to its shop and put the work through on one of its most modern machines. The result was that the same work was done on the new lathe in 1 1-16 minutes that required 20 minutes on the old lathe. The finishing process was accomplished in 12 minutes, as against 20 minutes in the other shop on the less modern machine.

The action of the National Machine Tool Builders' Association in declaring for the maintenance of prices is being supported in the trade and is believed to have been productive of good results. Secretary Montanus has been in receipt of many letters from the membership expressing their satisfaction that the resolution was passed and adding that buyers who had been holding off in expectation of a reduction were now sending in their orders.

The Lodge & Shipley Machine Tool Co. reports trade improved this month but on the whole only fair, especially at the close of the month. The outlook is difficult to forcast but it is not considered discouraging. A revival of foreign trade would be of great importance in improving conditions.

The American Tool Works Co. finds trade improved in the last few weeks and notes that the demand is for the heavier tools, such as large lathes and planers. Foreign trade is being sought and the outlook for business abroad is better. Germany is spoken of particularly in this connection.

The John Steptoe Shaper Co. finds trade fairly good and has received some foreign orders recently. The company is bringing out some new shapers and making improvements in its line, which it believes will make friends for its machines.

The Rahn-Mayer-Carpenter Co. had an order for nine lathes the past week for Belgium and has enough work now in hand to keep its plant busy. General trade, however, is only fair and orders are not easily obtainable.

The Cincinnati Milling Machine Co. regards the situation as showing improvement. Foreign business in the past three months has been 50 percent better than for the corresponding three months last year. A revival in the demand from Germany is noted particularly.

Greaves & Klusman have enough work to keep them going and from the inquiries in hand are hopeful that after the first of the year they will see increased business.

The Cincinnati Planer Co. is getting enough business to keep moving. The foreign trade is looked upon hopefully and the first of the year is expected to bring an increased demand.

ELECTRICALLY DRIVEN OVERHEAD DRILL.

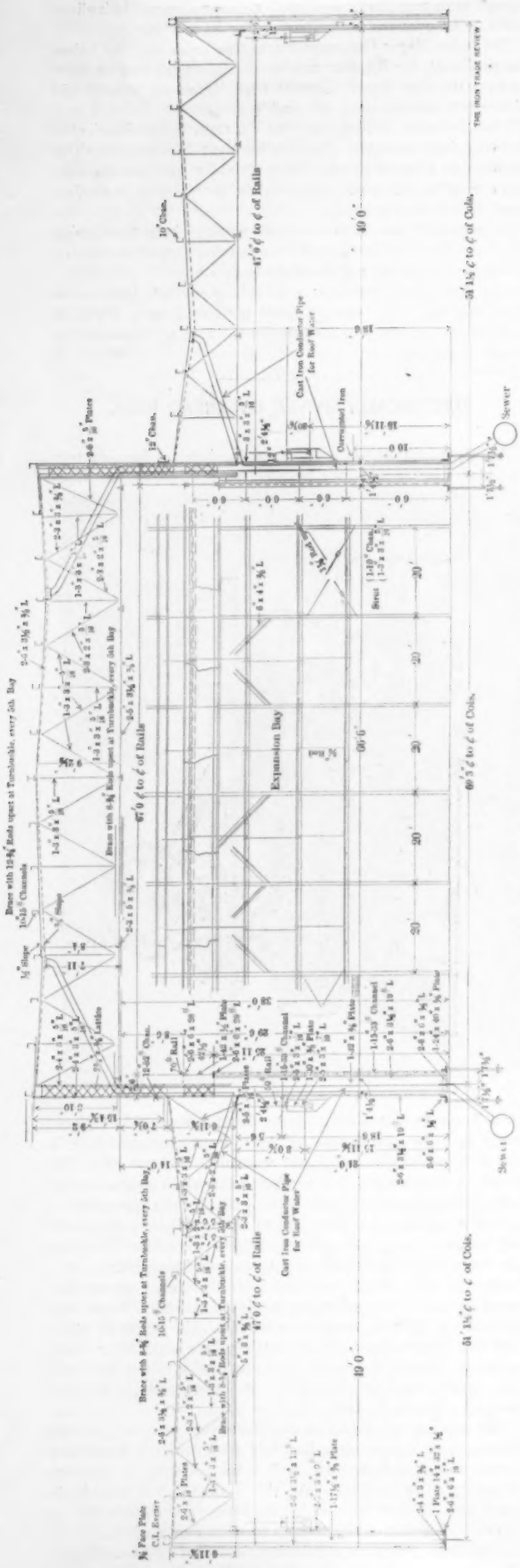
An electrically driven drill of the overhead or hanging type has been recently designed by Boynton & Plummer, of Worcester, Mass., manufacturers of shapers, drills, bolt cutters, etc. This machine was intended for fastening to a post or

ELECTRICALLY DRIVEN POST DRILL.

cross beam so that work of large dimensions could be placed under it. The drill is operated by a direct connected ½-h. p. Northern motor, running at 900 revolutions and 220 volts. The motor shaft has a 5¼-inch rawhide gear which drives a 10¼-inch gear on the upper shaft of the drill. To the upper shaft is splined a 6-pitch bevel gear with 21 teeth; this is in mesh with another gear of 35 teeth on the spindle, the combination giving 270 turns per minute as the highest speed of the drill.

The spindle is fitted for a No. 3 Morse taper, is counterbalanced and has a vertical traverse of 11½ inches. The machine is fitted for both lever and worm feed. The worm or wheel feed may be thrown in or out instantly by a small lever which raises or lowers the worm into mesh with the worm gear. The entire length of the drill is 36 inches and the distance from post to spindle is 19½ inches.

The machine as shown in the illustration was built for the laboratory of a prominent iron and steel company for testing purposes and designed to drill holes from ¾ to ¾ inch diameter. The builders make this style of drill with back-gears, also for belt drive with cone pulleys and countershaft to match. They also attach motors to meet the requirements for any drilling. All parts are made to standard and interchangeable.


Expansion Bay
67' 0" ℄ to ℄ of Rails
69' 3" ℄ to ℄ of Cols.
40' 0"
Cast Iron Conductor Pipe for Roof Water
Corrugated Iron
Sewer
Brace with 9-⅝" Rods upset at Turnbuckle, every 5th Bay
10-lb. Channels
Brace with 8-¾" Rods upset at Turnbuckle, every 5th Bay
Brace with 10-¾" Rods upset at Turnbuckle, every 5th Bay
Brace (1-10" Chan., 1-3 x 3 x ⅝ L)
Brace (1-10" Chan., 1-3 x 3 x ⅝ L)
10" Chan.
15" Chan.
Plates
Lattice
Rail
Channel
Plate
Angles
Tie Plate
C.I. Eccentr
1 Plate 34½ x 37½ x ⅜
Cast Iron Conductor Pipe for Roof Water
84' 1½" ℄ to ℄ of Cols.
67' 0" ℄ to ℄ of Rails
40' 0"

SECTIONAL ELEVATION OF TANK SHOP, SCHENECTADY PLANT OF AMERICAN LOCOMOTIVE WORKS.

NOVEL FEATURE IN SHOP CONSTRUCTION.

A specimen of shop architecture introducing some peculiarities is shown in the reproduction of a blue print here presented. It illustrates an elevation and section of the iron work of tank shop at the Schenectady plant of the American Locomotive Works. The details of the iron framing has some features which will be worth examination, but the special item of importance is the arrangement of the roof. This is not brought to a peak at the center nor do the sides slope up to the middle of the structure as in the common construction. The roof is in fact built on entirely another method and is hollowed out to collect the waste water instead of being arranged to spill it on to gutters at the edge. The roof water is carried off by cast iron conductor pipe running up the supporting columns of the building. This method brings the conductor piping entirely inside the structure and it is thus kept free from ice, a matter of some degree of importance where, as in Schenectady, there is a considerable fall of snow.

Mexican National Iron & Steel Co.

United States Consul James A. LeRoy, writing from Durango, Mex., about the Durango iron mountain, which has been so frequently described, gives some interesting information concerning the Mexican National Iron & Steel Co. What is said illustrates again that predictions of great industries based upon a plentiful supply of raw material overlook a number of important elements of success:

"One might think that such a property as this, where 'mining' consists simply in knocking down the sides of a mountain to obtain a rich ore, in a country whose industrial expansion is demanding larger and larger importations of iron and steel, would be better than the best proverbial bonanza of gold. The fact is, however, that the Mexican National Iron & Steel Co., an American concern, whose mining claims cover about one-half the mountain [calculated to contain 500,000,000 to 660,000,000 gross tons above the surface] has never until lately been a paying concern. This seems to have been due, first, to the fact that it was formerly operated with a view solely or primarily to sale of stocks, and, in the second place, to the difficulties in securing at a reasonable price fuel with which to operate it on a paying basis. Charcoal can be obtained near here, made from the timber on the Sierras to the westward, but its production has always been limited and relatively expensive. Coke was formerly brought from the United States and at such prices that the marketing of the company's iron products in Mexico, except at near-by points, was, when the high freight rates were added, very commonly at a loss, or no gain, in competition with American iron products. Mexican coke is now obtained and at considerably lower prices. Moreover, the concern is being managed primarily as a business enterprise. Facilities are being added for an increased output, and everything augurs great prosperity for this institution, which now turns out in its foundry and machine shops steam engines, hoisting machinery for mines, stoves, and simpler products, such as nails, as well as bar iron.

"The steel plant, which the company's name implies, may soon be added. Railroad extensions now promised to Durango will have a very direct influence in developing this business. The railroad to the Pacific coast would open up the great timber-clad regions of the Sierra Madre, disposing in large part of the fuel problem. A projected branch of the Mexican Central, bringing Durango much closer to Mexico City and, in particular, introducing an element of competition in freight hauling, would inevitably extend the market for the company's products much more rapidly than it could be met."

Work is nearing completion on the new power plant of the B. F. Sturtevant Co. at Hyde Park, Mass. The plant will comprise four water tube boilers, with stokers supplied by Sturtevant forced draft, an economizer with Sturtevant induced draft, and a complete outfit of Sturtevant generating sets, together with condenser, air compressor, etc. The Sturtevant exhaust head is used for separating the water and oil from the exhaust steam.

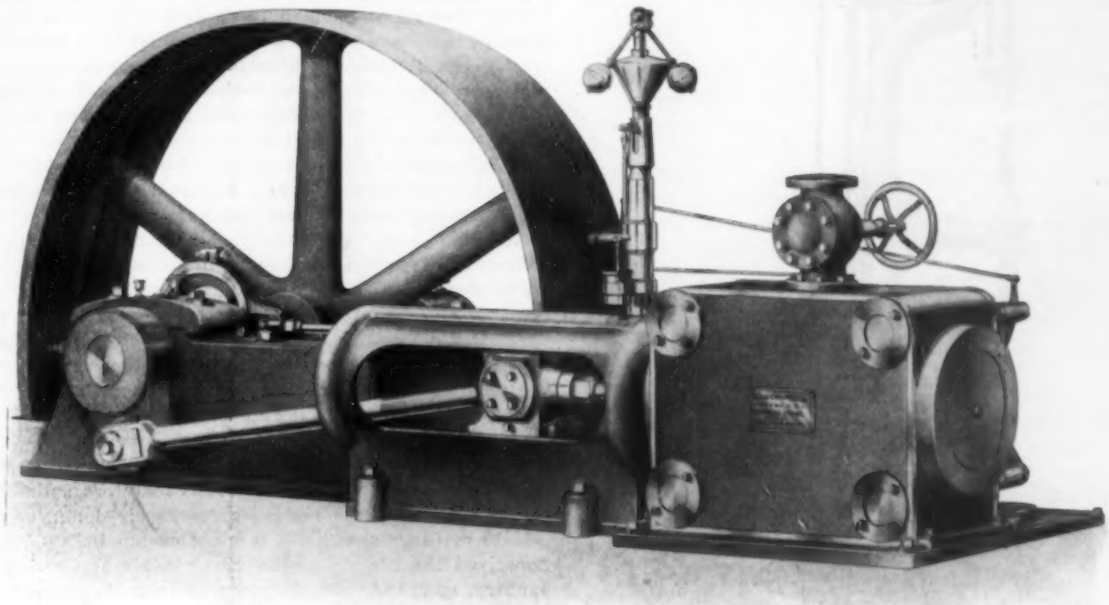
NEW STANDARD REYNOLDS CORLISS ENGINE.

We illustrate a new Corliss engine which is being brought out by the Allis-Chalmers Co., of Chicago, from the designs of Irving H. Reynolds. The field of Corliss engine design has been so fully worked over in the past that no strikingly novel designs are to be expected. The present machine, however, represents the experience of 26 years in building Corliss engines, and is believed to combine the desirable elements of the best designs.

Engines of the type shown are being built in seven sizes, ranging from 50 to 500 h. p., and for steam pressures up to 150 pounds. They are built of somewhat shorter strokes than have heretofore been customary in Corliss engines, with the idea of economizing space and more rigid construction. The speeds are rather higher than usual, ranging from 110 to 150 revolutions per minute, although these speeds are not in excess of those at which the Reynolds-Corliss engines of older design are frequently operated.

The frame is cast in one piece with the slide, of the box type, resting on the foundation for the entire length. The main bearing shells fit bored seats in the frame, thus insuring a solid bearing and permitting the easy removal of the shells by rolling them out around the shaft.

The slide is of the barrel type with bored guides. The crosshead is fitted with babbitt faced shoes and wedge adjustment. The piston rod is screwed into the crosshead and held firmly with a steel lock nut. The cylinder is of the round cornered type, is fitted with double ported steam and exhaust valves and lagged with planished steel. The cylinder sets on a cast iron base plate extending under the valve gear and serving as a drip pan.



NEW STANDARD REYNOLDS CORLISS ENGINE.

The valve gear is of the usual Reynolds-Corliss type, the wrist plate of skeleton pattern and fitted with a new type of disconnecting device which, while clamping the hook rod firmly, is very easily detached by hand. The dash pots are of differential plunger type without leathers or packing of any kind. The regulator is of the high speed weighted type, designed to control the engine within narrow limits of speed variation. The connecting rod is steel with solid forged ends, fitted with bronze boxes, babbitt lined on the crank pin ends, the boxes adjustable by means of screw actuated wedges. The crank is plain, polished on the face and protected by a planished steel oil guard which is not shown in the cut. The engines are fitted either with belt fly wheels, as shown, or with square rim wheels where used with direct connected electric generators. The crank and crosshead pins and main journals are of a size ordinarily used with heavy duty engines.

In brief, the engine is strong, simple and compact, and while nothing has been added for ornamentation, nothing contributing to economy or durability has been omitted.

AMALGAMATED ASSOCIATION'S EASTERN LODGES.

Until the summer of 1901, the main strength of the Amalgamated Association of Iron, Steel and Tin Workers was in the iron and steel plants west of the Allegheny mountains, the organization only having one lodge in the East at that time. Since that time, however, no less than 24 additional lodges have been organized and the membership of the association has been increased by 3,000. No regular scale has ever been formulated by the association for the Eastern mills, but at the next convention, to be held in Cleveland, next May, it is probable that a scale will be drawn up and presented to the manufacturers. Puddlers and finishers in the Eastern mills at the present time are paid from $1 to $1.50 a ton less than is paid to members of the association in Western mills, and should a scale be adopted for presentation to the Eastern manufacturers, this differential will be continued in favor of the East. Much difficulty will no doubt be experienced in securing the signatures of all the Eastern iron and steel mills in which the Amalgamated lodges exist to a scale such as is presented every year to the Western manufacturers.

Lodges are organized at the following plants: E. & G. Brooke Iron Co., Birdsboro, Pa,, Bird lodge; Glasgow Iron & Steel Co., Pottstown, Pa., Montgomery lodge; Potts Bros Iron Co., Ltd., Pottstown, Pa., Riverside lodge; Scranton Bolt & Nut Co., Scranton, Pa., Electric City lodge; Susquehanna Iron & Steel Co., Columbia, Pa., Pride of Columbia lodge; Lebanon Rolling Mill Co., Lebanon, Pa., Ben I. Davis lodge; American Iron & Steel Mfg. Co., Lebanon, Pa., Brandywine lodge; Reading Iron Co., Reading, Pa., North End, Oley Street Mill and Sheet Mill No. 43 lodges; Clearfield Steel & Iron Co., Clearfield, Pa., Hyde City lodge; Penn Iron Co., Ltd., Lancaster, Pa., M. F. Tighe lodge; New Haven Iron & Steel Co., New Haven, Conn., Elm City lodge; Johnson Forge Co., Wilmington, Del., Christian lodge; Rhode Island Perkins Horse Shoe Co., Valley Falls, R. I., Cumberland lodge; Passaic Rolling Mill Co., Paterson, N. J., Passaic lodge; Rockaway Iron & Steel Co., Rockaway, N. J., Rockaway lodge; Baltimore Rolling Mill Co., Baltimore, Md., Patapsco lodge; Hoopes Bros. Rolling Mill, Fort Washington, Pa., Fort Washington lodge; Elmira Rolling Mill Co., Elmira, N. Y., O'Boyle lodge; Westman Rolling Mill Co., Lockport, N. Y., Niagara lodge; Rome Merchant Iron Mill, Rome, N. Y., West Rome lodge; Phœnix Horse Shoe Co., Poughkeepsie, N. Y., Queen City lodge; Henry Disston & Sons, Tacony, Pa., Tacony lodge; Timmes & Hecht, Scranton, Pa., Keyser Valley lodge.

The plant of the Bogenschutz Stove & Range Co., Covington, Ky., which has been running under a receiver, will be sold at auction at an early date.

A SAW FOR BRASS SPRUES.

A machine for sawing the sprues of brass and similar castings is illustrated by the *Iron and Coal Trades Review*. The sprue rests in the angle of the supporting bar and the operator, who has both hands free to hold the castings, presses the foot lever by which the machine is started and the saw is fed through the work. The saws are made especially for the purpose and will cut the harder alloys of copper. Delta metal and aluminum. Sprues up to 1½ inches diameter are dealt with at a single stroke and larger sizes are severed with two or more cuts. The saw stops running with the release of the foot lever, but the exact manner in which the feed is produced, and the saw subsequently raised is not so evident. The feed of the saw is said to be by gravity and the descent of the cutter through the work may be checked by the operator but cannot be accelerated. A rate of feed in excess of the one dictated by those in charge is somehow impossible, but other than purely mechanical means are probably depended upon

A NEW GATE SAWING MACHINE.

to prevent the operations of the saw falling below good practice. The machines is manufactured by E. G. Herbert, of Manchaster.

The Texas Wire Fence Co., Denton, Texas, recently incorporated, is now negotiating for a building for its plant, and should it fail in securing the building will purchase a lot on which it will build. It is in the market for machinery, viz.: Automatic wire cutting and straightening machine, 5-h. p. gasoline engine, press for punches and dies, pipe cutting and threading machine, quick return drill, in fact everything that it can use to advantage for the manufacturing for which it is incorporated. The company does not expect to get its plant to running until in January, 1904. It has not purchased any machinery, but is getting best cash prices on machinery it will need.

A receiver has been appointed for the Henry McShane Mfg. Co., of Baltimore. The books of the company show that the assets are $536,525.28 and the liabilities $233,508.97. The surplus it is announced will insure the payment of all the creditors in full. The embarrasment of the company was, it is said, brought about by the stringency in the money market and inability to realize on quick assets.

THE MONELL AND TALBOT PROCESSES.

Some features of the Talbot and Monell processes for the operation of basic open-hearth furnaces have been under review before Patent Office tribunals. The Patent Office *Gazette* of Nov. 24 reports the decision of Commissioner Allen on an appeal by Benjamin Talbot from a decision of the examiner-in-chief. The latter had affirmed the decision of the examiner of interferences awarding priority of invention to Ambrose Monnell upon the following issue:

1. The method herein described of making steel which consists in introducing into a basic open-hearth furnace iron oxid and lime and molten pig-iron, substantially eliminating phosphorus from the iron while the iron is at a comparatively low temperature; withdrawing, at an early stage in the removal of carbon, the bulk of the slag containing the eliminated phosphorus, and heating the bath of metal and oxidizing the carbon until the carbon has been reduced to the point at which the metal is to be tapped.

2. The method herein described of making steel which consists in introducing into a basic open-hearth furnace iron oxid and lime and molten pig-iron, substantially eliminating phosphorus from the iron while the iron is at a comparatively low temperature; withdrawing at an early stage in the removal of carbon, the bulk of the slag containing the eliminated phosphorus, without withdrawing the metal, then heating the bath of metal and oxidizing the carbon until the carbon has been reduced to the point at which the metal is to be tapped.

3. The method herein described of making steel, which consists in introducing into a basic open-hearth furnace iron oxid and lime, heating the same, then introducing molten pig-iron, substantially eliminating phosphorus from the iron while the iron is at a comparatively low temperature; and withdrawing at an early stage in the removal of carbon, the bulk of the slag containing the eliminated phosphorus, heating the bath of metal and oxidizing the carbon until the carbon has been reduced to the point at which the metal is to be tapped.

The commissioner in giving his decision says:

"Monell is a patentee, and Talbot's application, which is a substantial copy of that patent, was filed six months after it was granted. The burden is therefore upon Talbot to prove his case beyond a reasonable doubt.

"The evidence shows and it is not disputed that Monell conceived the process as described in his application in January, 1900, and reduced it to practice in February, 1900. He filed his application on March 10, 1900.

"Talbot claims conception in 1888, disclosure in 1891, and reduction to practice in 1893. In his testimony he alleges a practical use of the process upon several occasions since 1893. His application was filed on Dec. 6, 1900. It appears from the evidence that the processes described and practiced upon the several occasions mentioned differed from each other and that none of them was the same as that described in the present application. Talbot simply copied Monell's patent and claims that what he did, although different from the specific process described, comes within the terms and meaning of the counts of the issue. The controversy has turned, therefore, principally upon the meaning of the issue. If the issue does not have the broad meaning contended for by Talbot, he cannot upon his own showing prevail in this proceeding.

"The examiner of interferences and the examiners-in-chief have very fully and clearly pointed out the fact that the issue cannot be given the construction contended for, and, approving their findings, it is scarcely necessary to add anything to their discussion of the matter. It is clear from the issue itself, and particularly from the issue read in connection with the description, that substantially all of the phosphorus which is to be removed is removed at an early stage, while the iron is at a low temperature and while the iron contains a high percentage of carbon. The bulk of the slag containing the phosphorus is then

drawn off, and this means that only a small amount of slag remains in the furnace. It does not mean that the slag is drawn off and replaced by other slag. This is made clear by the description of the purpose and object of the invention. One of the main purposes in removing the slag is to make a substantially bared bath, so that the iron may be easily and quickly heated. The whole purpose of the process is to practice the pig-and-ore process in an open-hearth furnace as rapidly as the pig and scrap process can be practiced, and anything which prevents this cannot be regarded as coming within the present process. Monell does away with the necessity for the use of scrap in order to obtain the rapidity of operation desired.

"The evidence as to what Talbot did has been discussed with great care and completeness by the examiner of interferences. As pointed out by him, the alleged disclosure to Mainwaring and the letters to See and Schwab do not include the process here in controversy. They refer to other processes. The process practiced at the Jefferson Steel Works at Birmingham in 1893, as described by Talbot and as described in the *Manufacturers' Record* of March 31, 1893, is not the same as the present process. As appears from the analyses, the phosphorus was not substantially eliminated and the process did not result in steel, but pig iron.

"Talbot says that he reduced the invention to practice in the works of the Pencoyd Steel Works in September, 1899, but it appears that scrap was generally used in the process then performed, and the record of heat produced shows that about fifty percent of scrap was used. Aside from the use of scrap, which it is the object of the present invention to avoid, it does not appear that substantially all of the phosphorus was removed as required by the issue.
sue.

"Talbot also claims to have reduced the invention to practice at the Pencoyd Steel Works in September, 1899, and thereafter, in what he calls the continuous process. That process, like the others, differed from that here in controversy in many particulars, among which it may be noted that only fifty percent of the phosphorus was removed.

"The evidence, taken as a whole, fails to show that Talbot was in possession of the invention prior to the date when Monell made it. Aside from the testimony as to the character of the processes performed by Talbot his conduct in reference to this invention is very significant and entitled to much weight. He claims to have been in possession of it more than ten years ago; but he made no effort to obtain a patent upon it, although he did patent some of the processes which he performed and which he now claims come within the present issue. When Monell read a paper before the Iron and Steel Institute describing his process, Talbot ridiculed it as a whole, although he said it included some steps which he had invented. Even after hearing that paper Talbot did not come in with his application; but six months later, after he had visited Homestead and seen Monell's process in operation, he made great haste to prepare his application. In preparing that application he did not describe what he had done, but copied the description of Monell's process from Monell's patent.

"It seems probable that Talbot after seeing Monell's process performed has convinced himself that what he had done some years before must have been substantially the same thing. It seems to have been an afterthought on his part in the light of Monell's disclosure, and the evidence does not support his claims. It must be held that Talbot had no conception of the process in issue until he had seen it performed by Monell.

"The decision of the examiners-in-chief is affirmed."

A hoisting plant, consisting of two 28 x 60 Corliss engines, with two 12-foot drums, with automatic safety devices to prevent overwinding, is to be installed at the Aragon mine, Menominee range. The plant is similar to that at the Savoy-Sibley mine, Vermillion range.

MODIFYING SYSTEMS OF MANAGEMENT.*

BY H. L. GANTT, SCHENECTADY, N. Y.

At the Saratoga meeting the papers on shop management and the allied subjects covered such a broad field that a thorough discussion of them in the time available was practically impossible, and consequently, as the writer has since found in going over the subject with members, many of the most important points in those papers were not brought out.

Most of the people the writer has talked with regarded the various things advocated as individual propositions, and approved or condemned according as they saw, or did not see how they could or could not be adapted to their works and their existing system of management. Many people apparently would like to adopt some of the ideas, but do not see how they can do so without making radical changes. This is due to the fact that few plants have in practical operation the basis on which the whole system depends for its ultimate success, namely a complete and accurate system of getting a record of all work done each day, and the amount of time spent in doing it. In other words a means of knowing in the office whether every order has been properly carried out or not, without actually going out into the shope and investigating. Whether the whole system as advocated is adopted or not this part is of great value to any manager, superintendent or foreman, and can usually be gradually introduced without stirring up any serious opposition. As a matter of fact it has been the writer's experience that all good men welcome such a system and do all they can to get it in operation, and if a little time be taken, a radical change may be made by methods that are not at all revolutionary.

A Complete System: Referring again, however, to the views of the members regarding the methods advocated at the Saratoga meeting, it seems that few have grasped the idea that what was advocated was not a series of isolated propositions, but a system of management having a number of parts working in harmony with each other, designed first to find out in detail what the maximum output of a plant should be, and then to make it to the interest of all concerned to obtain day after day that maximum output.

Different Views: As an example of how diverse the criticisms of the papers were, I may quote some of the extreme ones. One man, the manager of a large plant, thought that if the methods advocated by Mr. Taylor were attempted in his plant there would be a strike at once. A second man did not see why we did not compel a workman to give the maximum output without extra compensation if we knew how it should be done. A third man said to the writer, "Now for the first time I see how you can get the maximum output from your shop without having trouble with your men, and if you carry out the methods described I don't see how you can have trouble." These opinions, being those of well known and prominent men, are worthy of careful consideration.

Analysis of Opinions: Regarding the first opinion, that the introduction of the methods advocated by Mr. Taylor, and it was the study of unit times that was especially referred to, would produce a strike in his works, the reply is that *such study has never yet caused a strike.* That it is possible to cause a strike in almost any plant by dong this work in an obnoxious way is undoubtedly true; but it is equally true that the work may be done without serious opposition in almost any plant *if sufficient time and patience are devoted to it.* It is realized, however, only by those who have actually done the work how much time and patience may be needed, and a man who understands this work without the experience of others to guide him is apt to be discouraged, will find that his progress is extremely slow.

On the other hand if the workmen are so united in their determination that no one man can be found who will follow the wishes of the management and do exactly what is wanted without objecting to having the details observed and recorded, it would seem desirable to get such a man as soon as possible. This, however, is a condition the writer has never come across; and, while it may exist, is certainly very rare, and probably does not exist at all in any large plant, although it may take

*Read at the New York meeting (December, 1903,) of the American Society of Mechanical Engineers.

some time and patience to find the right man. When a start has been made and the good men begin to realize that what is being done is for their advantage as well as for that of the company, there need be no trouble provided men are allowed to realize the results of one step before another is taken.

The Second Opinion: That if we knew how to get the maximum output of a machine we should compel the workmen to get it without extra compensation is not in keeping with the spirit of the age. We cannot today in this country compel anybody to do anything. The employer must concede to the workman what he demands for himself—that he be allowed to do what he believes it to be his interest to do. In other words, when the employer has decided upon what he believes to be his interest, his only successful method of procedure is to make it to the interest of the workman to do what is wanted. It may take time and patience to make the workman realize what his true interest is and see it in the same light as the employer does, and unions may oppose it; but if the inducement is a fair one and the employe is subjected to no real hardship it is only a question of time when somebody will be found of sufficient independence to work for his own interest.

The Third Opinion: That tthese methods properly carried out should give the maximum output and be practically an insurance against labor trouble the writer leaves for the comment of others. Suffice it to say that the writer is finding an increasing number of men that are looking at the matter in that light, and asking for information as to the best method of beginning this work under the conditions that exist in their shops.

Introducing New Methods: It must always be borne in mind that everybody is suspicious of new methods, and that the only way to remove this suspicion is to show them that the new methods are going to help them in their work. If the first thing that is started is helpful to somebody, it will not be long before there is a sentiment in favor of the new system. The time-keeping department and the foremen usually find the system of daily returns from the men of such assistance to them that it soon has their support, and when the graphical daily balance begins to show up weak spots the best foremen realize they have at their command an instrument which will help them to increase the efficiency of their work by enabling them to put their efforts where they are most needed.

Having thus stimulated an interest in making improvement, the value of the detail methods as advocated by Mr. Taylor will soon be realized, after which their adoption is only a question of time.

The Office: The remarks so far have been with reference to the shop, but they are equally applicable to the office, for to have a schedule of what should be done in the office each day and a graphical representation on that schedule of what was done is of great advantage to the management, and is essential to proper harmonious relations between the office and the shop. Indeed to be able to make quickly each day such comparisons as the following for the day before is quite as important as to make similar comparisons of the shop work:

What drawings should have been completed,
What drawings were completed,
What purchase orders should have been placed,
What purchase orders were placed,
What material should have been received,
What material was received.

It also costs but little to make readily available each day a knowledge of what has been spent in labor and material on any piece of work up to the close of the day previous.

Fifteen hundred tons of Birmingham iron were shipped through the port of Mobile last month. The iron came in a large measure from the Sloss-Sheffield Co., and was exported to European countries. In Central America and Mexico there is a demand for coke which is being met in Alabama. A large shipment of coke was made from Mobile a few days ago.

A. L. Jacobs, of Niles, O., and R. H. Mehard, of Cincinnati, have organized a company, capital $300,000, to establish a car works at Henderson, Ky. The company will manufacture railway sleeping cars and interurban electric line equipment.

BRITISH FISCAL POLICY AND STEEL IMPORTS.

Just now the tariff debate that the Chamberlain proposal has brought on in Great Britain is concerned to a considerable extent with the iron industry. The English newspapers are having much to say about the "dumping" of German and American steel under the very eaves of British steel works, and the argument has waxed warm as to the policy of taking steps to prevent such importations. The London *Ironmonger* presents one incident of the controversy in the following, referring particularly to the tin plate trade:

"Mr. W. Brace, vice president of the South Wales Miners' Federation, having been put forward as a candidate for Parliamentary honors to represent a division in Glamorgan, Mr. A. Gilbertson, of the Pontardawe Steel, Tinplate & Galvanizing Works, has addressed to him a letter in which he says:

"'American steel bars were sold last Tuesday at Swansea Exchange at 81s. per ton in ship at Swansea. This price is about 7s. to 8s. per ton less than the cost of Siemens steel bars in Glamorganshire. Our steel works turn out 1,000 tons per week, which at 7s. per ton means £17,500 per annum. If we are obliged to close our steel works it will mean a loss of 2,000 tons of coal per week to collieries, loss to iron founders, engineers, railways, etc., and loss of wages to men, say of £37,000, per annum. What do you think ought to be done to prevent this loss to workmen, collieries, etc.? The American bars do not contribute a single penny to our rates and taxes. Our works pay in rates alone £1,500 per annum. Of course, tin plates, etc., will be depreciated by buyers to the extent of the 7s. or 8s. per ton above mentioned.'

"In reply, Mr. Brace says that if Mr. Gilbertson will inform him why it is that the Americans can produce steel bars more cheaply than local firms can do, he will endeavor to supply him with an answer. Meantime he asks Mr. Gilbertson whether, if he were merely a tin plate or galvanized sheet manufacturer, it would not be to his interest to have steel bars at 81s. instead of 90s. per ton? He also puts to Mr. Gilbertson two other questions:

"'1. If British steel industries are to be relieved by the imposition of an import tax, what incentive will there be for manufacturers to develop their productive resources in the most scientific manner?

"'2. Do not the South Wales tin plate and galvanized sheet manufacturers depend for existence upon having a supply of steel bars at £4 to £4 10s. per ton?'

"Mr. Brace suggests that Mr. Gilbertson might by a little reorganization of his plant manufacture steel bars at 81s. per ton; but if he cannot do this—and some measure of relief must be afforded to meet foreign competition—then it should come by way of removing such economic disadvantages as excessive rents, royalties, railway charges, etc., which severely handicap our industries, and not by resorting to 'that dangerous industrial narcotic'—Protection."

The relation of Canadian iron and steel products in the proposed change in British fiscal policy is also a factor in the account. It is referred to by Walter S. B. McLaren, who writes to a London paper as a director of three large iron companies. After inquiring whether the Baltour idea is to put a tariff on pig iron from the Canadian bounty-fed blast furnace industry, he says:

"In consequence of the advantage of this bounty the Canadian ironmasters have exported Canadian pig iron to this country, and have sent us, or, to use the current phrase, have dumped upon us, in the years 1901-2 nearly as much iron as Germany, Holland, Belgium, and the States put together. The actual figures are, for those two years, Germany, Holland, and Belgium, 78,615 tons; the States, 45,973 tons; and Canada, 103,202 tons. This surely, is dumping with a vengeance, and is unquestionably due to the benefit which the Canadian makers derive from their bounty. * * * We are entitled to know whether the prohibition of bounty-fed imports is to apply to colonial produce as well as to foreign produce if Mr. Balfour carries out his policy, and I trust that some explanation on this important point may be forthcoming."

The Norton-Edgar Can Co., Cincinnati, Ohio, has finished the placing of its machinery, and the plant is now in operation, giving employment to about 300 men.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Terrell Foundry & Machine Co., Terrell, Texas, has been incorporated with a capital of $10,000, to manufacture and sell iron and other castings. The incorporators are: A. H. Dashiell, L. F. Garland and C. M. Crumbaugh.

The J. M. Lehmann Co., of New York City, has been incorporated with a capital of $25,000, to manufacture machinery. The directors are: L. B. Lehmann, of Dresden, Germany; T. C. Weygandt, of Brooklyn, and F. B. Lehmann, of New York City.

Articles of incorporation have been issued by the secretary of State of Illinois for the Primm Jump Gate Co. The directors are: W. H. Evans, Joseph A. Tabke, John Q. Primm, John E. Dehner, John P. Keller.

The Reciprocating Rotary Engine Co., New York City, has been incorporated with a capital of $100,000. The directors are: C. F. Jewett and A. M. Davidson, of New York City, and Herman Neilson, of South Brooklyn.

Charles A. Lefferts & Co., of Brooklyn, N. Y., have been incorporated with a capital of $15,000, to manufacture iron and other metals. The directors are: C. A. Lefferts Sr., Ida A. Concanen and J. J. Jung, of Brooklyn.

The Poag-Ferguson Machine Co., Lancaster, S. C., has been incorporated with a capital of $6,000, to sell machinery and conduct a repair shop.

The Collegeville Foundry & Machine Co., Collegeville, Pa., has been incorporated with a capital of $25,000.

The Standard Machine Co., Woodsville, N. H., has been incorporated with a capital of $90,000.

The A. Kilpatrick Sons Foundry Co., St. Louis, has been incorporated with a capital of $10,000. The incorporators are: Alex. Kilpatrick, Alex. Kilpatrick Jr., and Alfred B. Kilpatrick.

A new foundry and machine shop, with a capital of $25,000, has been incorporated at Baltimore, with offices at 410 East Pratt street. The officers are: Charles Tyler, president; F. Oscar Reuter, secretary; and Walter B. Tyler, general manager.

The National Gate Co., recently incorporated at Deansboro, N. Y., has elected the following officers: President, R. H. Hadcox; vice president, Wm. F. Kimball; secretary and treasurer, A. D. Van Vechten; superintendent of construction, Geo. S. Patrick. The company informs us that it expects to equip a plant with power, drills, forges, pipe-cutters, threaders, saws, etc., and to begin the manufacture of a self-operating gate, for farms, lawns, etc., to be made of iron and steel. The company expects to have its plant in operation in January.

The L. B. Dozier Co., Columbia, S. C., capital $100,000, has been incorporated. The company has its buildings already erected and will be ready for business by Jan. 1. The stock is owned principally by the Cameron & Barkley Co., Charleston, S. C., and L. B. Dozier & Co., Columbia, S. C. The company is to manufacture cornice and metal work of various kinds, wholesale plumbers', steam fitters', builders', mill and general machinery supplies. The following officers have been elected: L. B. Dozier, president, Columbia; C. Bissell Jenkins, first vice president, Charleston; M. B. Barkley, second vice president, Charleston; F. F. Whilden, treasurer, Darlington; E. N. Joyner Jr., secretary, Columbia.

The Janesville Barb Wire Co., Janesville, Wis., has been incorporated with a capital of $150,000. The incorporators are: James Harris, Arthur J. Harris, Ida Harris and Zella Harris.

The White River Iron Co., Kansas City, Mo., capital $45,000, all paid, has been incorporated. The incorporators are: F. E. Wear, A. L. Murphey, Russell M. Smith, Frank W. Irwin, Francis C. Downey, Frank Brasier and George V. Lyddane.

The Anniston Stove Works Co. has been organized at Anniston, Ala., through the efforts of the Commercial Club of that city. The capital stock is $50,000, and the incorporators are: Huga Graf, of Belleville, Ill.; T. B. Ehrlick, of Indianapolis, Ind.; C. W. Fouches, of Lexington, Ky.; O. W. Snyder, Lexington, Ky.; Ross Blackmon, Anniston.

The Missouri Steel & Iron Co., Kansas City, Mo., capital $50,000, all paid, has been incorporated by F. E. Wear, Frank Brasier, N. V. Petgen, Frank W. Irkin and Francis C. Downey.

The A. Kilpatrick Sons' Foundry Co., St. Louis, Mo., capital $10,000, all paid, has been incorporated by Alex. Kilpatrick, Alex. Kilpatrick Jr., and Alfred B. Kilpatrick.

The Elm City Brass & Rivet Co., Plainville, Conn., has been incorporated with the following officers: President, T. W. Corbett, New Haven; treasurer, A. H. Condell, Plainville; secretary, John B. Minor, Plainville.

The Holub-Dusha Co., New York City, capital $10,000, has been incorporated to manufacture machinery. The incorporators are: Thomas Greenwood, Passaic, N. J.; James S. Williams, New York City; Herbert Schubert, Fort Wadsworth, Staten Island, N. Y.

The Carroll Oilless Bearing Co., Worcester, Mass., has incorporated with a capital of $300,000, to manufacture and deal in all kinds of machinery and parts thereof. The incorporators are: Wm. T. Carroll, Harrison B. Hoyle, O'Dell Boynton, John L. Truax and Fred A. Lapham, all of Worcester, Mass.

The Oliver Engine Co., of New England, principal office Boston, Mass., capital $50,000, has been incorporated to manufacture Oliver rotary and other engines. The officers are: President, Charles H. Barney, Newton; treasurer, Wm. H. A. Clark, Brookline; clerk, Frederick W. Hill, Newton.

Fires and Accidents:—

One fireman was killed and seven injured while fighting a fire which destroyed the 5-story brick building of Smith-Myers & Schnier & Co., manufacturers of cigar box machines at Cincinnati, Nov. 26. The loss is estimated at $60,000, partially covered by insurance.

The architectural iron works of Richey, Brown & Donald in Long Island City, N. Y., burned Nov. 25, involving a loss of $300,000, chiefly on machinery and work on hand.

New Construction:—

The Eagle Steel Range Co., Shelbyville, Ind., whose plant was recently destroyed by fire, is rebuilding and will have double the capacity of the former plant. The company will be ready to fill orders by Jan. 1.

The engineers of the Midvale Steel Co. have revised the plans for the forge shop to be erected at the works in Nicetown, Pa., preparatory to the manufacture of armor plate for the Government. Originally it was intended to have the building 256 feet long, but it has been decided to make the structure 80 feet longer than it first proposed. Estimates on the work were received Nov. 27.

The Board of Trade of Ensley, Ala., has been negotiating with capitalists of Baltimore, of whom Mr. W. G. Pinkerton is one, for the location of a street car manufacturing plant at Ensley. It is now announced that all preliminaries have been settled and that the ground will be broken on Jan. 1 for the building of the plant.

The city council of Hamilton, O., has decided to grant the application of the Niles Tool Works Co. for the vacation of Lowell street. This action will permit the company to largely increase its output. The plans for construction of additional buildings had already been prepared and the work in part completed. The vacation of the street will greatly facilitate the plans of the company.

The Foreman Can Co., Irwin, Pa., has finished the erection of additional buildings, and the concern now has an output of 1,000 cans a day.

The Bristol Bolt & Nut Co., Bristol, Conn., will build an addition to its plant.

J. M. Martin, Knoxville, Tenn., will build a machine repair shop in that city. The plant will be thoroughly equipped for all kinds of repair work.

J. R. Cavanaugh, of the Big Four railroad, O. W. Winkelhofel, of Indianapolis, and H. E. Trague, of Cincinnati, the

two latter connected with the Pennsylvania railroad, have made a contract with the Board of Trade of Vincennes, Ind., to locate a plant for the manufacture of cars at Vincennes. The plant will be entirely new, will occupy 40 acres, and it is expected that it will employ about 750 men.

The United States Coal Co., will build a machine shop at Bradley, O. Contracts have just been closed.

The contract for the steel work for the buildings for the Lincoln Stove & Range Co., Fremont, O., has been let to the Garry Steel & Iron Co., of Cleveland.

Land has been cleared and excavations are being made at East Cambridge for the Builders' Iron & Steel Co.'s plant, which will consist of 3 buildings, one 60 x 90 feet; another, 30 x 30 feet, and a third, 60 x 30 feet.

Timmes & Hecht, proprietors of the spike and galvanized iron mill at Scranton, Pa., will build a large addition. They will add a new puddling mill, and make other improvements.

The Champion Blower & Forge Co., Lancaster, Pa., has purchased 3 acres adjacent to its works, and will erect a new foundry.

The Steel Spring Co., of New Kensington, Pa., is putting in new machinery, and after Jan. 1, 200 more men will be put to work.

The Wabash railroad will erect new shops on its Buffalo division, and there is considerable rivalry among cities along the line to secure the new plant.

The Brennan Boiler Works Co., Battle Creek, Mich., is building an addition to its East Fountain Street plant in the way of a large building for its test, storage and boiler rooms. The dimensions are 30 feet high, 45 feet wide and 150 feet long.

The Pittsburg and Valley Districts:

The puddling furnaces and rolling mills of Moorhead Bros. & Co., Sharpsburg, Allegheny, Pa., resumed operations this week after a brief shutdown.

The plant of the Braddock Tool Co., Braddock, Pa., will be considerably enlarged during the next few months. Considerable new machinery will also be added to the present departments.

The sheet, pipe and skelp mills of the plant of the Youngstown Iron Sheet & Tube Co., Youngstown, O., were shut down this week on account of lack of orders.

The upper and lower mills of the Carnegie Steel Co., Youngstown, O., were placed in full operation this week. The Girard plant, however, was shut down.

The stack of the Struthers Furnace Co., Struthers, O., will be blown out some time between Dec. 3 and 10.

Stack No. 1 of the Shenango Furnace Co., Sharpsville, Pa., has been blown out.

The Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., will resume operations next week.

Furnace No. 1 of the Duquesne plant of the Carnegie Steel Co., Duquesne, Pa., has just been blown out for relining and repairs, after making a most remarkable record on one lining. The stack has been in continuous operation for 7 years, 4 months and 15 days, the next longest record having been made by furnace H of the Edgar Thomson plant of this company. This furnace was blown in on June 8, 1896, and during this period of continuous operation it produced 1,287,500 tons of iron, making the average daily output of 478 tons.

The tinning department of the Shenango plant of the American Tin Plate Co., New Castle, Pa., was placed in full operation this week.

General Industrial Notes:—

The rolling mill of the Tennessee Coal, Iron & Railroad Co., Birmingham, has resumed operations, after a short shutdown.

The National Twist Drill & Tool Co., Detroit, Mich., recently incorporated, will use the plant on Twenty-first and Standish streets, formerly occupied by the Detroit Twist Drill Co., which removed a year ago to Twenty-first and Porter streets. The new company will begin operations in about 10 days.

The Port Huron Steel & Screen Co., Port Huron, Mich., has been negotiating with the Board of Trade of Norwalk, Conn., with a view of locating in that place. Representatives of the Port Huron company recently visited Norwalk.

The A. B. Hazzard Machinery Co., St. Louis, Mo., recently incorporated, does not expect at present to build. The company is manufacturing diamond core drilling machines, and is well supplied with orders.

The Onondaga Mfg. Co., Syracuse, N. Y., recently incorporated, has taken over the property and business of the Onondaga Mfg. Co., of that city. The former partners of the old company were the promoters, J. D. Smith being elected president and Robert N. Phinney the secretary-treasurer. The demand for the products of the old company became so great that it became necessary to greatly increase the plant and facilities. The output is mostly hardware and household specialties, but the intention is to manufacture anything of merit in sheet metal, cast metal and wood and wire goods. The company has partly completed designs for an extensive new plant with a large number of departments, but the plans are not as yet ready to be made public. The allotment of stock has been nearly all subscribed for and the directors are considering the advisability of an increase of capitalization.

The plant of the Day Mfg. Co., which formerly had a manufacturing business at Lake View, N. Y., has been sold in bankruptcy court to A. N. Garford, of Cleveland, for $7,900. The buyer represented the Federal Mfg. Co., of Cleveland, which is not prepared to announce its plans in regard to the plant.

F. D. Becker, New Orleans, La., has returned to that city from the East, where he went to purchase machinery for a large can manufacturing concern, which is to be started in New Orleans about Jan. 1. The new concern will have a capital stock of $50,000.

The Santa Rita Mining Co., which is controlled by American interests, is about to install a new boiler plant in its mines in Mexico. James A. Carpenter, of Torrington, Conn., is president of the company.

The plant of the Michigan Tin Can Co., Ltd., Detroit, has been sold to the Wilson & Hayes Mfg. Co., of Cleveland, for $10,000. The new owners will manufacture metallic automobile bodies and specialties used in the construction of automobiles.

The Edison Foundry & Machine Works, Edison, Ohio, were dedicated a few days ago with services, which included addresses, reading of scripture and prayer. The foundry is 70 x 70 feet. The officers are: President, Frank Romans; vice president, W. G. Lefever; secretary and treasurer, T. E. Wilson; manager, P. S. Plumb.

Operations have been suspended in the rolling and blooming mills of the Pennsylvania Steel Co., Steelton, Pa., and will not be resumed until Jan. 1. Extensive repairs are to be made. Of the 500 men employed in the mills, about 200 will be used in making repairs.

The steel mill of the American Steel & Wire Co., at Quinsigamond, Mass., has been shut down for an indefinite period, throwing 150 men out of employment. The general slackness in business is given as the cause of the shutdown. The company is not the only concern in Worcester that is suffering from lack of business in the iron trade. Nearly every concern is feeling the effect of the depression and many are running with only half their usual force of men.

The yard, scrap and fixtures of H. Silberman & Co., Cleveland, recently declared bankrupt, was sold Nov. 30 by the trustee, A. V. Cannon, at auction, to E. Dreifus, Trimble & Co., of Philadelphia and Pittsburg, for $11,200. The property was appraised at $17,731. The examination of H. Silberman has been in progress before the referee this week. He testified that in the years from 1899 to 1903, both inclusive, his profits were $495,000 and that he lost many thousands of dollars in bad accounts and speculation.

The big pump in the Great Western mine, Menominee range, has been pulled to the surface and the mine is now rapidly filling with water.